REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: NORDA Technical Note 70	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): APP FY-80 Task I Report: Comparisons of Vertical Sound Speed Profiles from the SIMAS and ICAPS Environmental Data Bases with High Quality Measured CTD and STD Data	5. TYPE OF REPORT & PERIOD COVERED: Final
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): E. Hashimoto	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Naval Ocean Research & Development Activity, Numerical Modeling Division, OSTL, NSTL Station, Mississippi 39529	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: Naval Ocean Research & Development Activity, Ocean Programs Management Office, Code 500, NSTL Station, Mississippi 39529	12. REPORT DATE: September 1980
	13. NUMBER OF PAGES: 73
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Sound speed profiles
Environmental data bases
CTD data
STD data

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report compares the "on-board vertical sound speed (SS) profiles from the SIMAS and ICAPS Environmental Data Bases with High Quality measured CTD and STD data for 17 different geographic locations.

The purpose of this study, using identical values of measured temperatures (from CTD and STD sensors) as "on-board" input BT observations, was to compare the resulting predicted SIMAS and ICAPS sound speed profiles with "assumed oceanography" (CTD and STD measured observations).

NORDA Technical Note 70

Naval Ocean Research and
Development Activity
NSTL Station, Mississippi 39529

APP FY-80 Task I Report: Comparisons of Vertical Sound Speed Profiles from the SIMAS and ICAPS Environmental Data Bases with High Quality Measured CTD and STD Data

NAVAL OCEAN RESEARCH AND DEVELOPMENT ACTIVITY
NORDA
1976

E. Hashimoto*

Numerical Modeling Division
Ocean Science and Technology Laboratory

September 1980

*Present Address:
Ocean Data Systems, Inc.
3255 Wing Street
San Diego, CA 92110

<u>APP FY-80 TASK I REPORT</u>

"COMPARISONS OF VERTICAL SOUND SPEED PROFILES FROM THE SIMAS AND ICAPS ENVIRONMENTAL DATA BASES WITH HIGH QUALITY MEASURED CTD AND STD DATA."

by

E. HASHIMOTO

30 SEPTEMBER 1980

NAVAL OCEAN RESEARCH AND DEVELOPMENT ACTIVITY
NORDA Code 321
NSTL Station, Mississippi 39529

ABSTRACT

This report compares the "on-board" vertical sound speed (SS) profiles from the SIMAS and ICAPS Environmental Data Bases with High Quality measured CTD and STD Data for seventeen different geographic locations.

The purpose of this study, using identical values of measured temperatures (from CTD and STD sensors) as "on-board" input BT observations, was to compare the resulting predicted SIMAS and ICAPS sound speed profiles with "assumed oceanography" (CTD and STD measured observations).

ACKNOWLEDGEMENTS

The author would like to express his appreciation towards certain individuals who have been associated with or assisted in segments of this study. Without the cooperation of these individuals, this study could not have been completed. Very special appreciation to Dr. A.L. Anderson (NORDA 320), Dr. J.A. Davis and Mr. R. Lauer (both with NORDA 321) for providing invaluable technical guidance, to LCDR A. Galus (NORDA 530) for providing funding support, to Mr. J. Schumacher (ODSI), Mr. G. Kerr and Mrs. C. Parker (both of NORDA 320) for providing the required support in the preparation of this report.

CONTENTS

I. INTRODUCTION

The SIMAS (Sonar In-situ Mode Assessment System) and ICAPS (Integrated Command Anti-submarine warfare Prediction System) programs address different system applications but are similar in that each has been developed for use as an "on-board" prediction system. It is known that SIMAS and ICAPS do not employ identical environmental data bases. The extent to which these data bases differ is being addressed in a separate study. The purpose of this particular study was to:

- compare predicted SIMAS and ICAPS vertical sound speed profiles with measured in-situ CTD (Continuous-Temperature-Depth) or STD (Salinity-Temperature-Depth) data.
- present, whenever possible, similarities or dissimilarities between the predicted SIMAS and the predicted ICAPS sound speed profiles with measured CTD and STD data.
- discuss the implications of these similarities and dissimilarities.
- compare the "goodness" of the predicted SIMAS and ICAPS to the "Assumed Oceanography".

Since this study was of limited scope it focused entirely on vertical sound speed profile comparisons. Reliable and processed CTD or STD data available at seventeen different geographic locations were used in this study as the "Assumed Oceanography". Figure 1 presents the geographical locations for the comparisons.

In an earlier study entitled, "Comparison of the ICAPS and SIMAS Historical Environmental Data Bases" by E. Hashimoto, NORDA 321, FY-79 APP Task II Report, dated 28 September 1979, the author compared predicted vertical sound speed profiles from the SIMAS and ICAPS environmental data bases using XBT (expendable bathythermograph) data as input. It also presented "significant" differences found between the two environmental data bases. That report, which presents the selection of appropriate SIMAS and ICAPS historical sound speed profile, is being published as a NORDA Technical Memo #66 titled, "Comparisons of Historical and in-situ Vertical Sound Speed Profiles from the SIMAS and ICAPS Environmental Data Bases".

In the present study, predicted SIMAS and ICAPS vertical sound speed profiles using CTD or STD temperature data as in-situ input are compared to sound speed profiles calculated using Wilson's equation.

Footnote: Comparison of bottom loss provinces and bottom loss versus grazing angle curves used by SIMAS and ICAPS were also conducted by the author. At 17 sites, ICAPS and SIMAS results were compared; bottom loss provinces were compared in the Mediterranean Sea. The results of this study are contained in NORDA Technical Note No. 71.

II. APPROACH USED IN STUDY

The approach used in this study was to obtain and establish a set of test case profiles using measured ocean environmental data with which the predicted SIMAS and ICAPS sound speed profiles could both be compared. The test case profile data are from reliable CTD and STD observations. The CTD and STD observations are considered in this study as being the "assumed" or real oceanography. CTD and STD test cases were selected so as to avoid biasing the results towards any given system. The selections were made on the reliability (author's confidence in the observations) and availability (accessible in appropriate format to impact this study) of CTD and STD data.

Both CTD and STD probes have an accurate temperature sensor. The STD also measures salinity. The values of temperature from both sensors are recorded during the observation period. The literature generally states that the relative accuracy of the CTD is approximately $\pm$ 0.005^{o}C for temperature. The STD has a relative temperature accuracy of $\pm$ 0.02^{o}C, and a relative salinity accuracy of $\pm$ 0.02 parts per thousand.

Identical values (measured) of temperature from either the CTD or STD were used as input data for SIMAS and ICAPS sound speed calculation and treated as if the values were those taken by in-situ XBTs. Vertical sound speed profiles were derived from each system. The SIMAS and ICAPS predicted sound speed profiles were plotted along with the computed sound speed profiles from either the CTD or STD observations. The intent for such plots was to illustrate the similarity between the predicted SIMAS or predicted ICAPS vertical sound speed profiles to "assumed oceanography".

The designations used and the locations of the in-situ test cases are tabulated in Table I. The sources for the CTD and STD test cases are identified in Table II.

III. COMPARISONS

In this section the results of the various comparisons are presented along with supporting information. In the simulated comparisons of predicted SIMAS and ICAPS sound speed profiles to "assumed oceanography", similarities and dissimilarities were found.

In some cases, similiarities and dissimilarities appear to be, more or less, consistent or reoccurring. In other cases, they appear unique in their occurrence. Presented, are the generalized similarities and major dissimilarities found when comparing the predicted SIMAS and ICAPS profiles with the assumed oceanography. The similarities and dissimilarities are indicated in the appropriate sections to follow.

- All temperature and salinity data from CTD and STD units were sent to the Naval Underwater Systems Center (NUSC), New London, CT and to the Naval Oceanographic Office (NOO), for SIMAS and ICAPS processing, respectively.
- Results were returned to NORDA where they were plotted.
- The accuracy and correctness of all plots were triple checked to eliminate possible errors which may have resulted from reading (interpreting) the data sheets, key punching, unit conversion, or from plotting of incorrect data files.
- All profiles were generated by personnel at NUSC (for SIMAS) and NOO (for ICAPS).
- All "on-board" input data into SIMAS and ICAPS were identical in-situ temperature profiles recorded by the CTD and STD temperature sensors.
- Quantitative comparisons for similarity and/or dissimilarities in sound speeds were conducted for values:

  $\overrightarrow{SS}$, at the surface (Table III)

  $\overrightarrow{SS}$, at the layer (SSL) (Table IV)

  $\overrightarrow{SS}$, at 1000 feet (SS1000) (Table V)

  $\overrightarrow{SS}$, at the sound channel axis (SSCA) (Table VI)

- Quantitative comparisons for similarity and or dissimilarities in depth (D) were conducted for values:

  D, at the layer (in feet) (DLD) (Table VII)

  D, at the depth of the sound channel axis (in feet) (DSCA) (Table VIII)

Figures 2 through 18 contain comparisons of vertical sound speed profiles which were predicted from the SIMAS (dashed lines), and ICAPS (dotted lines) environmental data bases, and measured by in-situ CTD/STD (both as solid lines) observations.

Tables (IX), (X), (XI), (XII), (XIII), and (XIV) present qualitative differences in predicted sound speeds at the surface, at the layer, at 1000 feet, at the channel axis, in the depth of the layer and the channel axis, respectively. Table (XV) contains the numerical values of sound speeds computed from CTD and STD sensors. Table (XVI) contains the numerical values of sound speed computed from SIMAS. Table (XVII) contains the numerical values of sound speed computed from ICAPS.

IV. SUMMARY OF THE COMPARISONS

As stated in the introduction, the purpose of this study was to compare the predicted SIMAS and ICAPS sound speed profiles with (actual) CTD or STD data (considered as the "assumed oceanography"), present similarities or dissimilarities, and to discuss any implication of such similarities or dissimilarities for certain test cases.

Tabulations of the quantitative differences for SS at the surface, at the layer, at 1000 feet, at the deep sound channel axis are presented on tables III through VIII. There were certain similarities and dissimilarities which appear more frequently than others. Tables IX through XIV are presented in an attempt to qualitatively simplify these similarities and dissimilarities. Comparisons for SIMAS, ICAPS and the "assumed oceanography" have been made of the values in sound speed (in ft/sec) at the surface, depth of the layer, at 1000 feet, and at the deep sound channel axis. Comparisons are made between the ICAPS and SIMAS predicted results with measured sound speeds from CTD or sound speed calculations using Wilson's equation from STD measurements. A brief summary of these tables (IX) through (XIV) are as follows:

<u>For Sound Speed Profile Comparison In Sound Speeds</u>

- at the surface (17 test comparisons):

  <u>"none to slight" differences:</u>
  ICAPS = 14 cases
  SIMAS = 2 cases

  <u>"1 f/s $< \overrightarrow{SS} <$ 7 f/s" differences:</u>
  ICAPS = 3 cases
  SIMAS = 7 cases

  <u>"7 f/s $< \overrightarrow{SS}$* $<$20 f/s" differences:</u>
  ICAPS = 0 cases
  SIMAS = 6 cases

  <u>"20 f/s $< \overrightarrow{SS}$** $<$40 f/s"</u>
  ICAPS = 0 cases
  SIMAS = 2 cases

- at the layer, (SSL) (14 test case comparisons)

"none to slight" differences:
ICAPS = 14 cases
SIMAS = 2 cases

"1 f/s < SSL f/s" differences:
ICAPS = 3 cases
SIMAS = 7 cases

"7 f/s < SSL* < 20 f/s" differences:
ICAPS = 0 cases
SIMAS = 6 cases

"20 f/s < SSL** < 40 f/s" differences:
ICAPS = 0 cases
SIMAS = 2 cases

- in sound speeds at the channel axis out of 17 test cases:

"none to slight" differences:
ICAPS = 3 cases
SIMAS = 0 cases

"1 f/s < SSCA < 3 f/s" differences:
ICAPS = 4 cases
SIMAS = 2 cases

"3 f/s < SSCA* < 7 f/s" differences:
ICAPS = 2 cases
SIMAS = 5 cases

"7 f/s < SSCA** < 12 f/s" differences:
ICAPS = 5 cases
SIMAS = 4 cases

"12 f/s < SSCA*** < 20 f/s" differences:
ICAPS = 0 cases
SIMAS = 0 cases

"20 f/s < SSCA****" differences:
ICAPS = 0 cases
SIMAS = 3 cases

- in sound speeds at 1000 feet out of 17 test cases:

"none to slight" differences:
ICAPS = 10 cases
SIMAS = 0 cases

"1 f/s<SS1000< f/s" differences:

ICAPS = 5 cases
SIMAS = 7 cases

"6 f/s <SS1000* < 12 f/s" differences:

ICAPS = 2 cases
SIMAS = 3 cases

"12 f/s<SS1000** < 20 f/s" differences:

ICAPS = 0 cases
SIMAS = 4 cases

"20 f/s< SS1000*** <75 f/s" differences:

ICAPS = 0 cases
SIMAS = 0 cases

"75 f/s <SS1000**** <100 f/s" differences:

ICAPS = 0 cases
SIMAS = 2 cases

"100 f/s <SS1000*****" differences:

ICAPS = 0 cases
SIMAS = 1 case

In Depth

- in the depth of the layer out of 17 cases:

"none to slight" differences:

ICAPS = 3 cases
SIMAS = 3 cases

"2 feet<DLD <30 feet" differences:

ICAPS = 9 cases
SIMAS = 8 cases

"30 feet<DLD*<90 feet" differences:

ICAPS = 3 cases
SIMAS = 4 cases

"90 feet<DLD** <150 feet" differences:

ICAPS = 1 case
SIMAS = 0 cases

"150 feet<DLD***<250 feet" differences:

ICAPS = 1 case
SIMAS = 0 cases

"250 feet < DLD****" differences:
ICAPS = 0 cases
SIMAS = 2 cases

- in the depth of the primary sound channel axis, out of 14 test cases:

"less than 300 feet" differences:
ICAPS = 7 cases
SIMAS = 6 cases

"300 feet < DSCA* < 600 feet" differences:
ICAPS = 3 cases
SIMAS = 2 cases

"600 feet < DSCA** < 1200 feet" differences:
ICAPS = 4 cases
SIMAS = 2 cases

"1200 feet < DSCA*** < 2000 feet" differences:
ICAPS = 0 cases
SIMAS = 3 cases

"2000 feet < DSCA****" differences:
ICAPS = 0 cases
SIMAS = 1 case

- ICAPS utilized the CTD/STD input temperature data above 1000 feet more than SIMAS.
- The "rejection" of in-situ temperature information in SIMAS is clearly too restrictive. The consequent use of archival information results in large discrepancies with CTD/STD results.

V. CONCLUSIONS

In the previous study (NORDA TN No. 66) which compared the predicted SIMAS and ICAPS Historical and INSITU vertical sound speed profiles as well as presented "significant" differences, there were no comparisons made with real INSITU measurements. In this study, this has been conducted to test for "goodness" and the results are presented.

Upon review of the comparison plots and the tables of similarities and dissimilarities, it is clear that ICAPS demonstrates a noteable superiority to SIMAS in its ability to predict measured sound speed from an "XBT" obtained from CTD or STD data. This does not imply, however, that ICAPS does not need improvement as will be discussed under recommendations.

The authors conclusions based on tables (III through VIII) and (IX through XIV) are as follows:

- "Assumed oceanography" was reproduced more closer by ICAPS.
- Sound speeds at the surface were reproduced more closer in the North Atlantic and North Pacific Oceans by ICAPS.

  ICAPS reflects a significantly larger quantity (14 out of 17) of cases where the values of sound speeds at the surface agree (<1 f/s) closely with the CTD/STD observations than SIMAS (2 out of 17).

  Where ICAPS has zero cases, SIMAS showed 8 out of 17 cases where the values of sound speed at the surface differ between either 7 to 20 f/s, or 20 to 40 f/s.

- Sound speeds at the layer were reproduced more closer in the North Atlantic, North Pacific and Indian Oceans by ICAPS.

  ICAPS reflects a significantly larger quantity (14 out of 17) of cases where the values of sound speeds at the layer agree (<1 f/s) closely with the CTD/STD observations than SIMAS (2 out of 17).

  Where ICAPS has zero cases, SIMAS showed 8 out of 17 cases where the values of sound speed at the layer differ between either 7 to 20 f/s, or 20 to 40 f/s.

- Sound speeds at 1000 feet were reproduced more closer in the North Atlantic Ocean by ICAPS.

ICAPS reflects a significantly larger quantity (10 out of 17) of cases where the values of sound speeds at 1000 feet agree ($<$ 1f/s) closer with the CTD/STD observations than SIMAS (0 out of 17). SIMAS showed 7 cases to be greater than 12 f/s at 1000 feet of which 3 of this 7 are greater than 75 f/s. ICAPS on the other hand shows all of its values at 1000 feet not exceeding 12 f/s.

- Neither ICAPS nor SIMAS were impressive in their handling of sound speeds at the sound channel axis.

ICAPS showed that in 9 out of 17 cases, the values of sound speed at the axis were $<$ 7 f/s and SIMAS showed 7 out of 17 were $<$ 7 f/s. SIMAS showed 3 cases to be $<$ 20 f/s at the channel axis, and ICAPS had none.

- Neither ICAPS nor SIMAS were impressive in their handling of the depth of the layer.

ICAPS showed the depth of the layers to differ between 2 to 30 feet in 9 out of 17 cases and SIMAS shows the depth of the layers to differ between 2 to 30 feet in 8 out of 17 cases.

- Neither ICAPS nor SIMAS were impressive in their handling of the depth of the sound channel axis.

ICAPS showed the depth of the sound channel axis to differ between 0 - 300 feet in 7 out of 14 cases, and SIMAS showed it in 6 out of 14 cases. ICAPS showed the depth of the sound channel axis to differ by <u>greater than 600 feet</u> in 4 out of 14 cases and SIMAS showed it in 6 out of 14 cases.

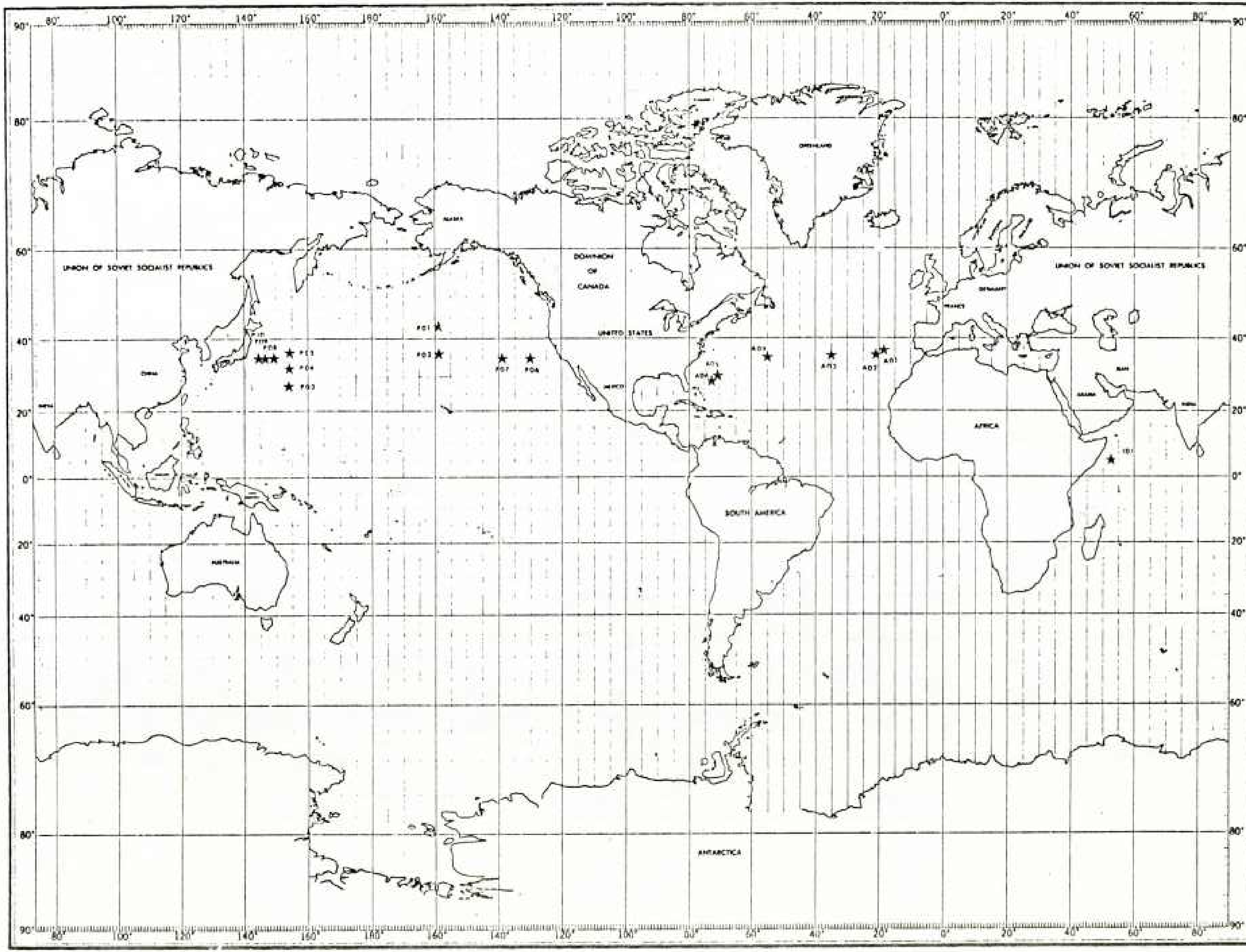
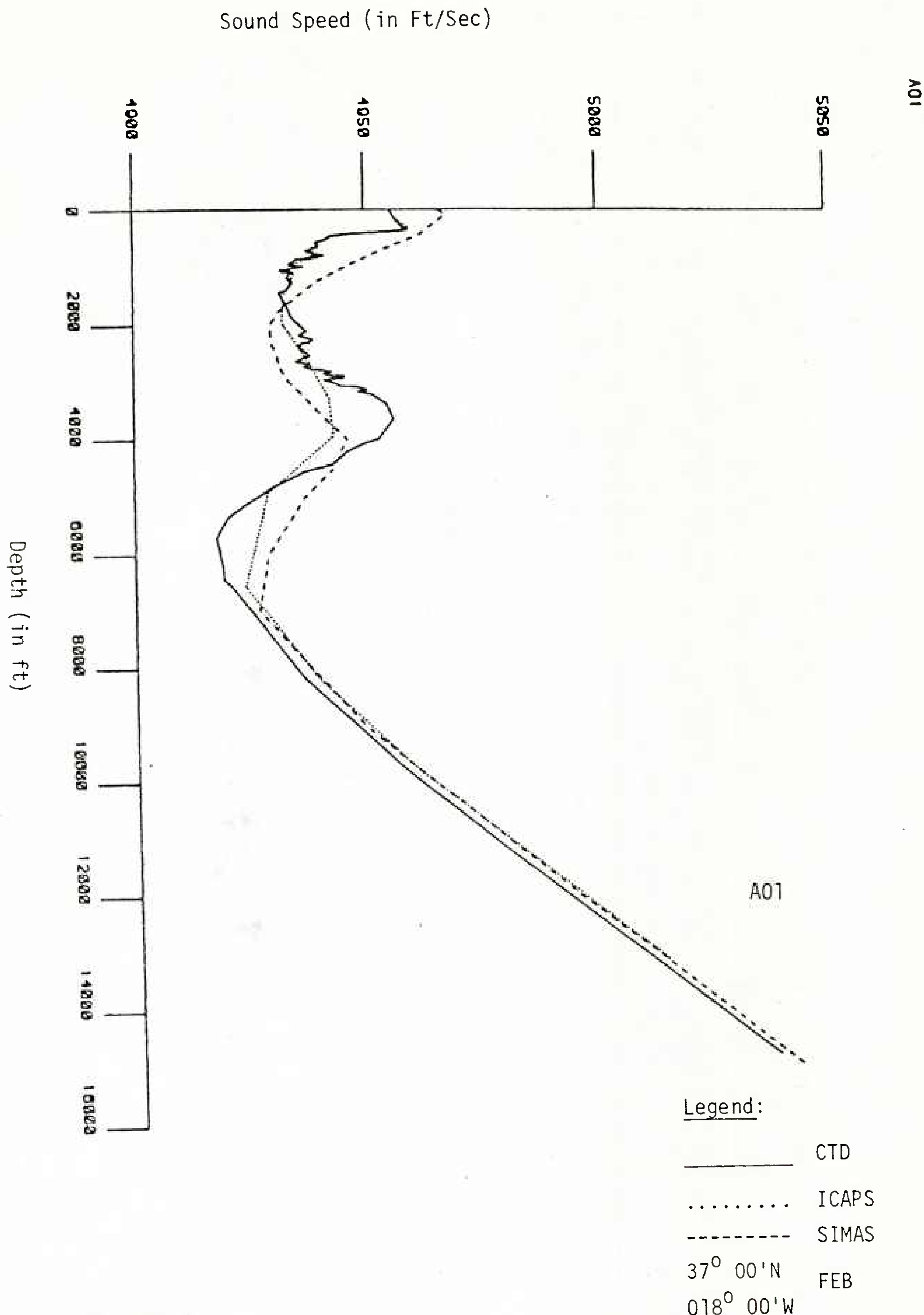


FIGURE 1. Geographical locations of the sites for comparison

FIGURES 2-18

- Plots of derived SIMAS, derived ICAPS vertical sound speed profile comparisons with CTD or STD observations.



Sound Speed (in Ft/Sec)
A01
4900
4950
5000
5050
0
2000
4000
6000
8000
10000
12000
14000
16000
Depth (in ft)
A01
Legend:
CTD
ICAPS
SIMAS
37° 00'N
018° 00'W
FEB

FIGURE 2

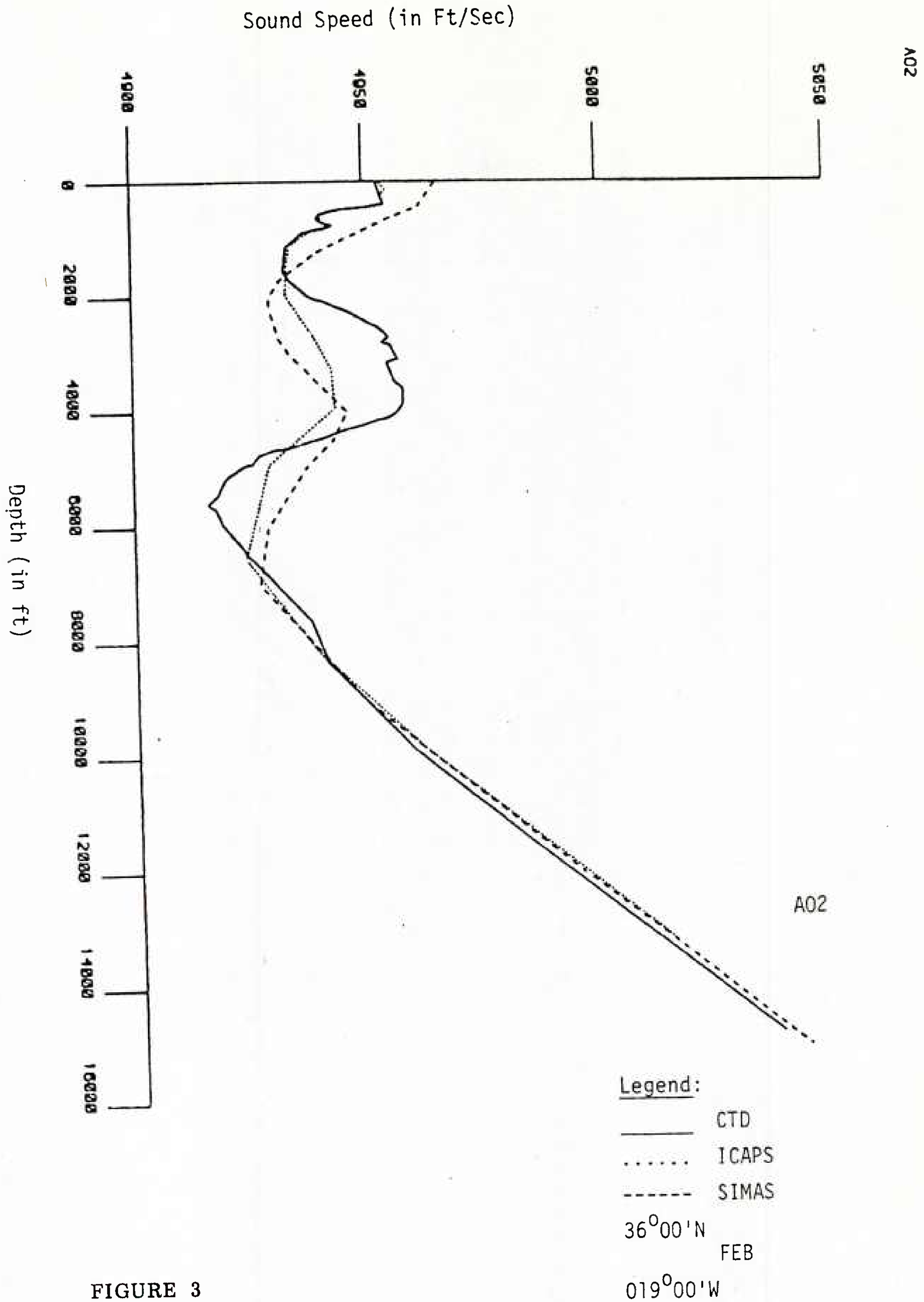

Sound Speed (in Ft/Sec)
4900
4950
5000
5050
A02
0
2000
4000
6000
8000
10000
12000
14000
16000
Depth (in ft)
A02
Legend:
CTD
ICAPS
SIMAS
36°00'N
FEB
019°00'W

FIGURE 3

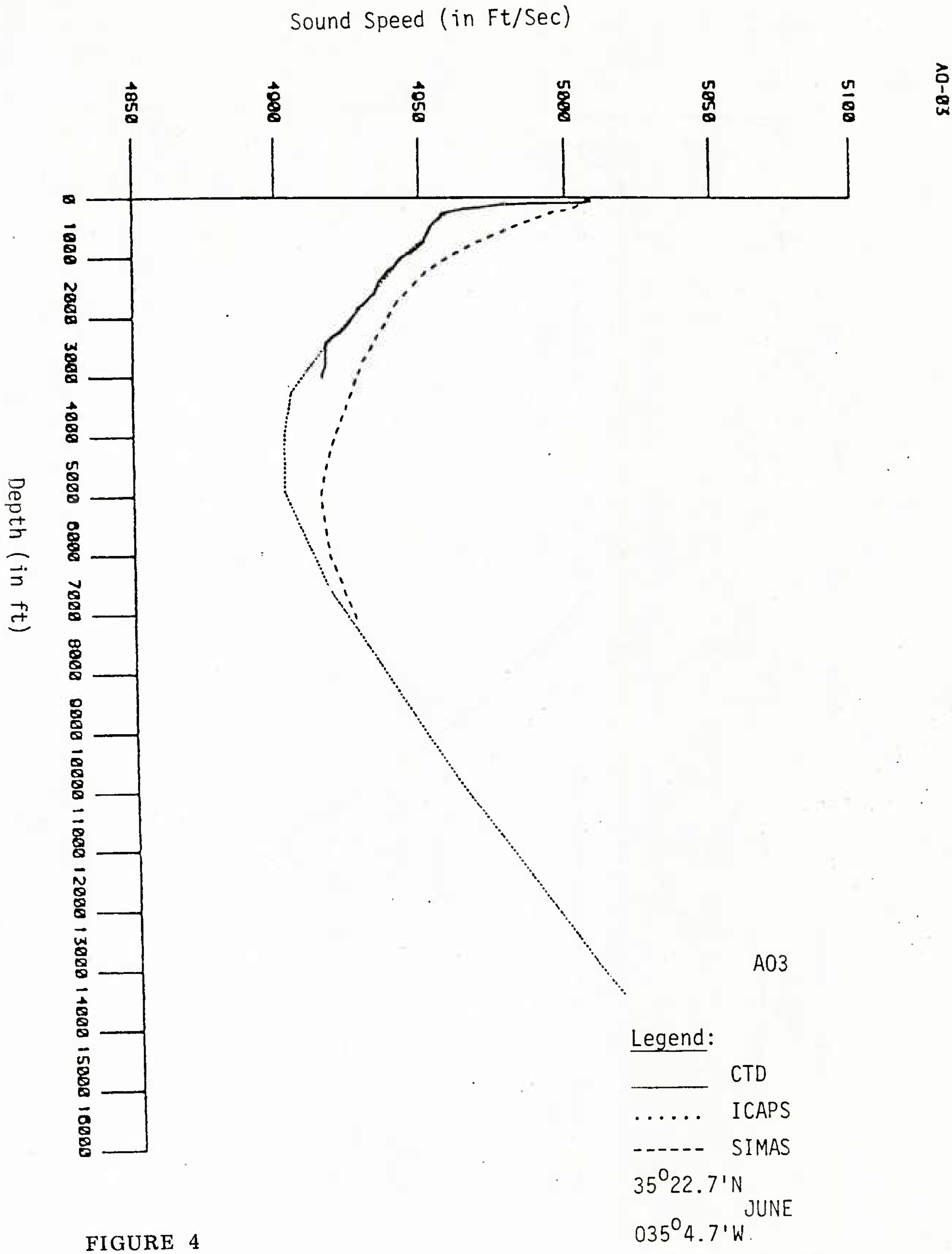
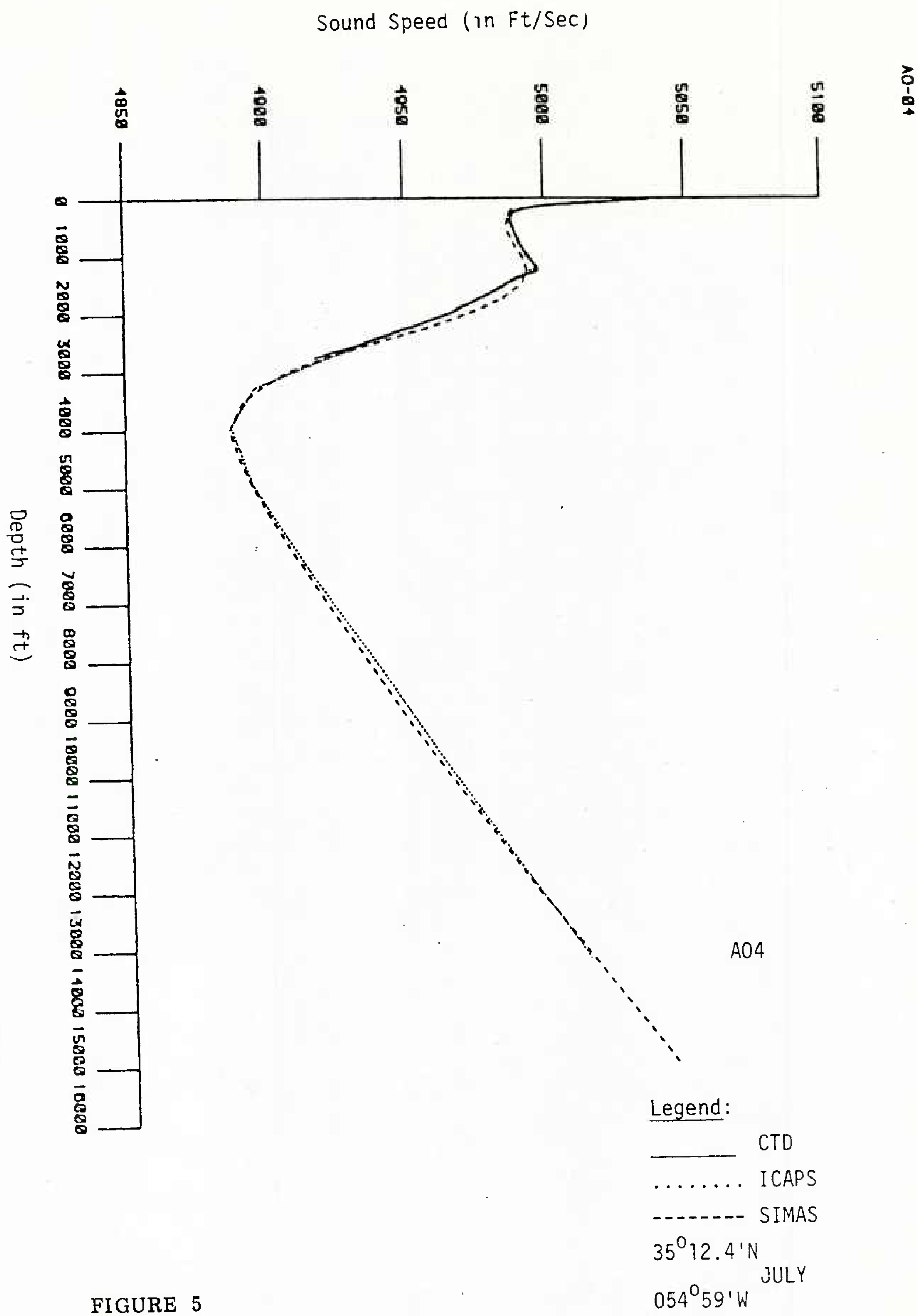

Sound Speed (in Ft/Sec)
4850
4900
4950
5000
5050
5100
A0-03
Depth (in ft)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
A03
Legend:
CTD
ICAPS
SIMAS
35°22.7'N
JUNE
035°4.7'W

FIGURE 4



Sound Speed (in Ft/Sec)
AO-04
4850
4900
4950
5000
5050
5100
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
Depth (in ft)
AO4
Legend:
CTD
ICAPS
SIMAS
35°12.4'N
JULY
054°59'W

FIGURE 5

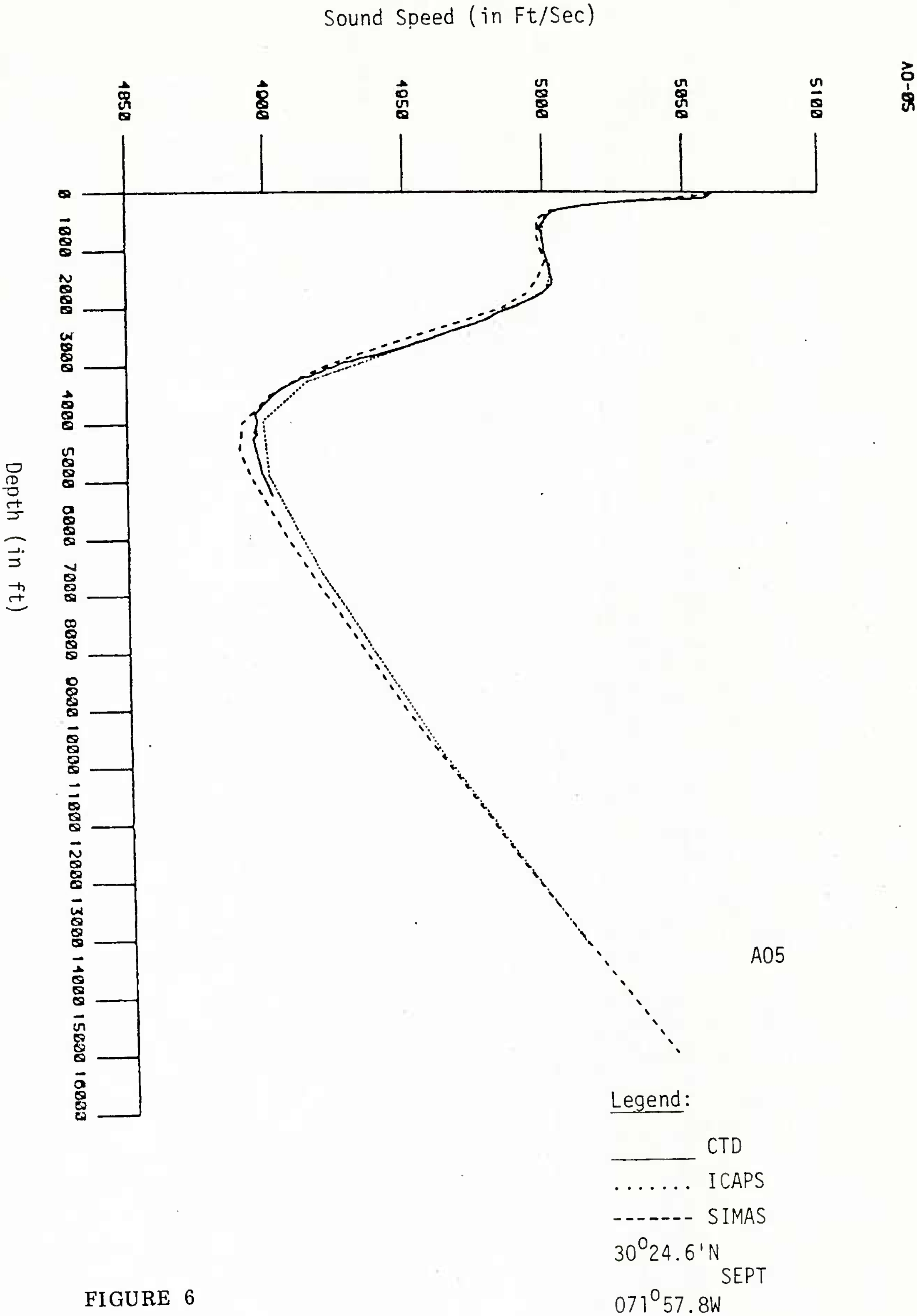

Sound Speed (in Ft/Sec)
4850
4900
4950
5000
5050
5100
AO-05
Depth (in ft)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
A05
Legend:
CTD
ICAPS
SIMAS
30°24.6'N
SEPT
071°57.8W

FIGURE 6

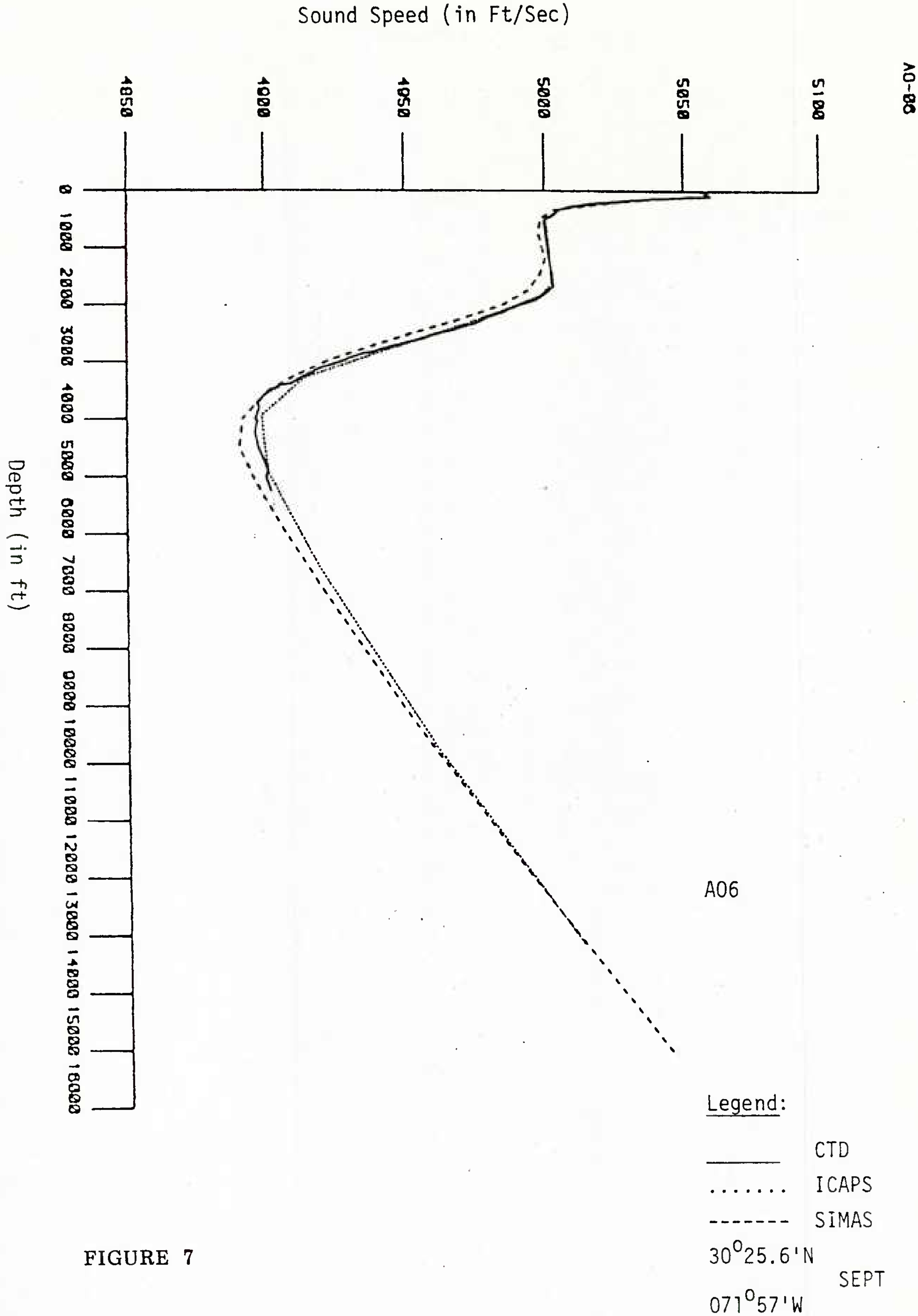

Sound Speed (in Ft/Sec)
4850
4900
4950
5000
5050
5100
Depth (in ft)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
16000
A06
Legend:
CTD
ICAPS
SIMAS
30°25.6'N
SEPT
071°57'W

FIGURE 7

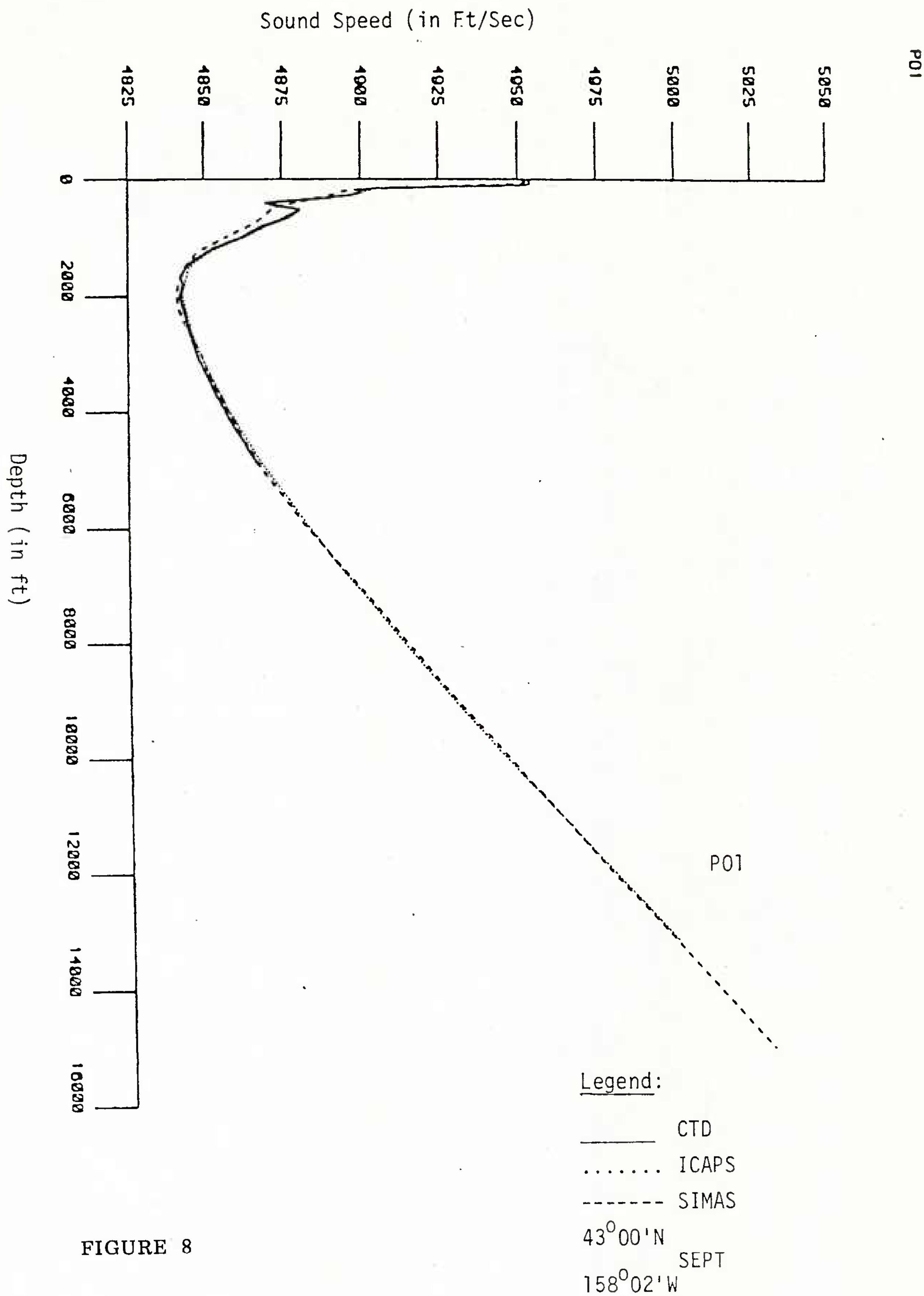
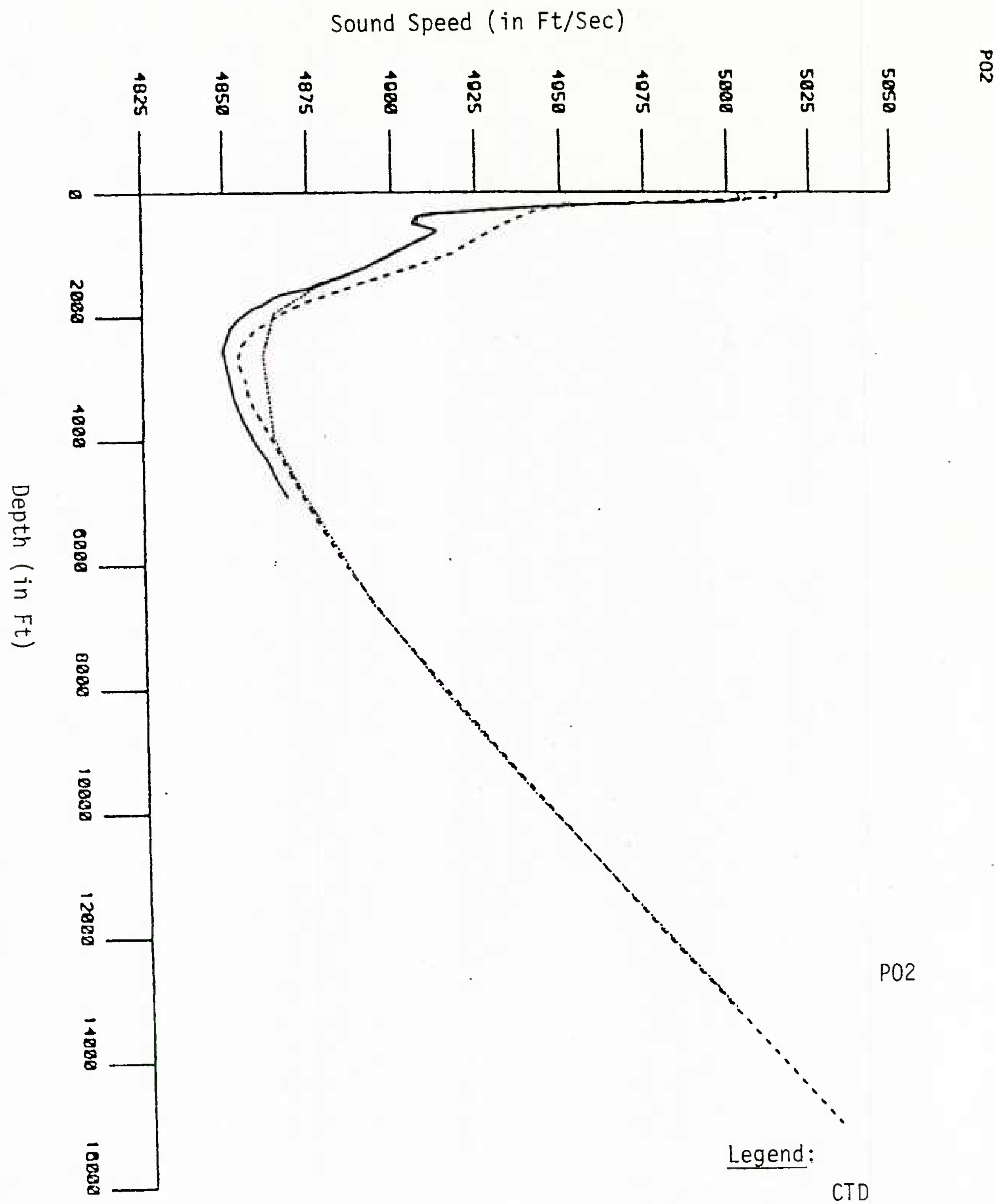

Sound Speed (in Ft/Sec)
P01
4825
4850
4875
4900
4925
4950
4975
5000
5025
5050
Depth (in ft)
0
2000
4000
6000
8000
10000
12000
14000
16000
P01
Legend:
CTD
ICAPS
SIMAS
43°00'N
SEPT
158°02'W

FIGURE 8



Legend:

CTD

ICAPS

SIMAS

$35^{o}59'N$

OCT

$158^{o}00'W$

FIGURE 9

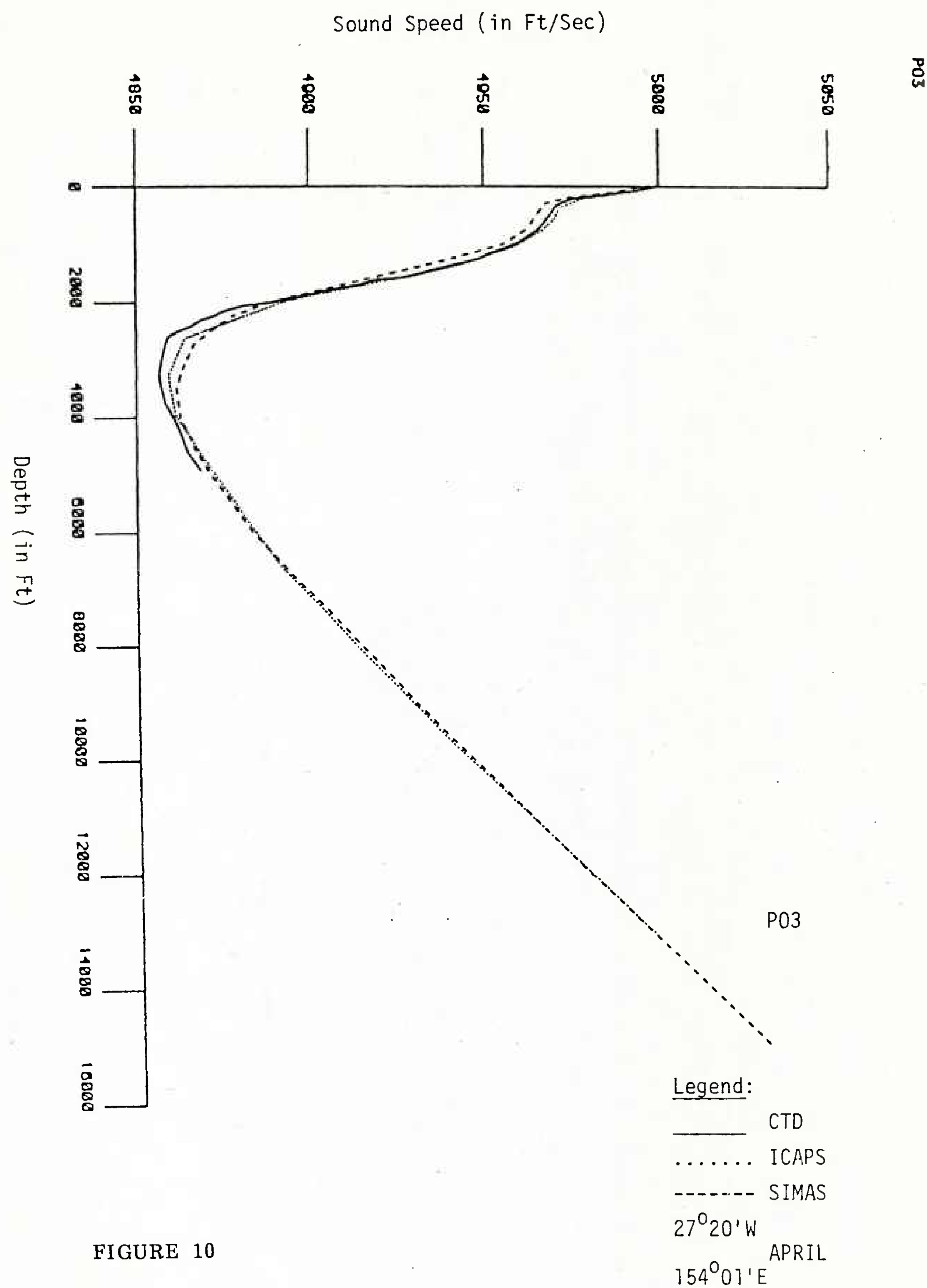

Sound Speed (in Ft/Sec)
P03
4850
4900
4950
5000
5050
Depth (in Ft)
0
2000
4000
6000
8000
10000
12000
14000
16000
P03
Legend:
CTD
ICAPS
SIMAS
27°20'W
APRIL
154°01'E

FIGURE 10

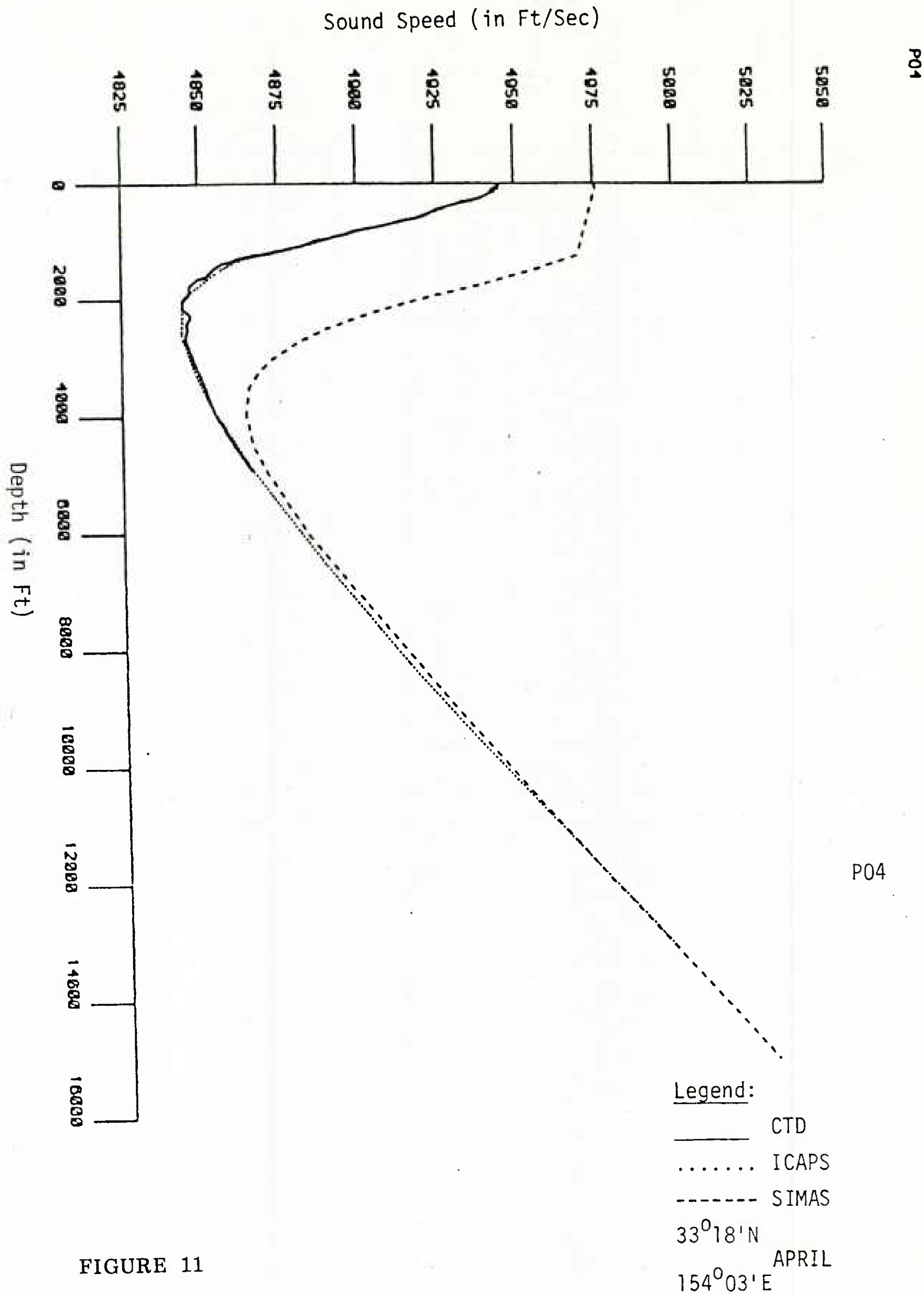

Sound Speed (in Ft/Sec)
P04
4825
4850
4875
4900
4925
4950
4975
5000
5025
5050
Depth (in Ft)
0
2000
4000
6000
8000
10000
12000
14000
16000
P04
Legend:
CTD
ICAPS
SIMAS
33°18'N
APRIL
154°03'E

FIGURE 11

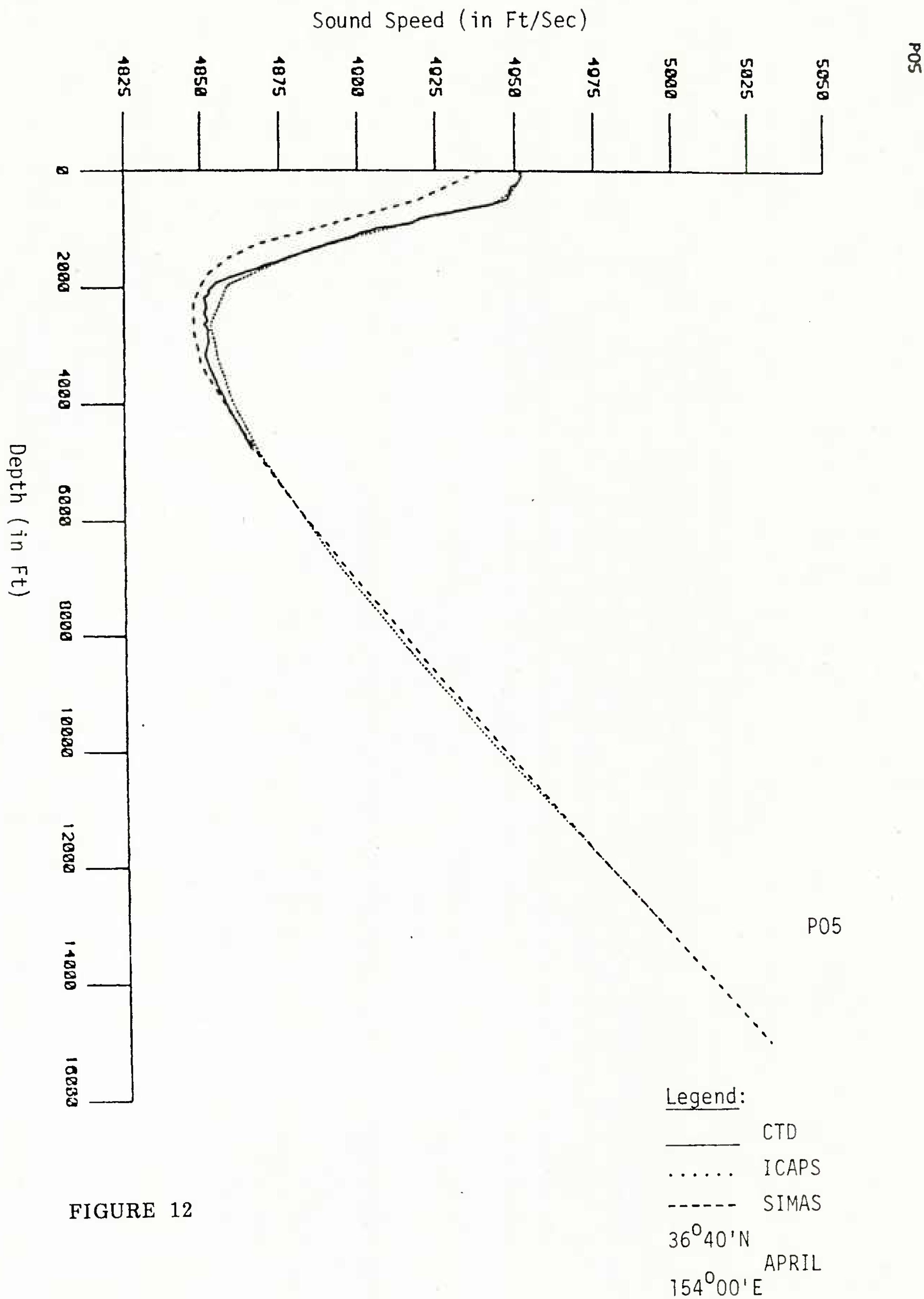
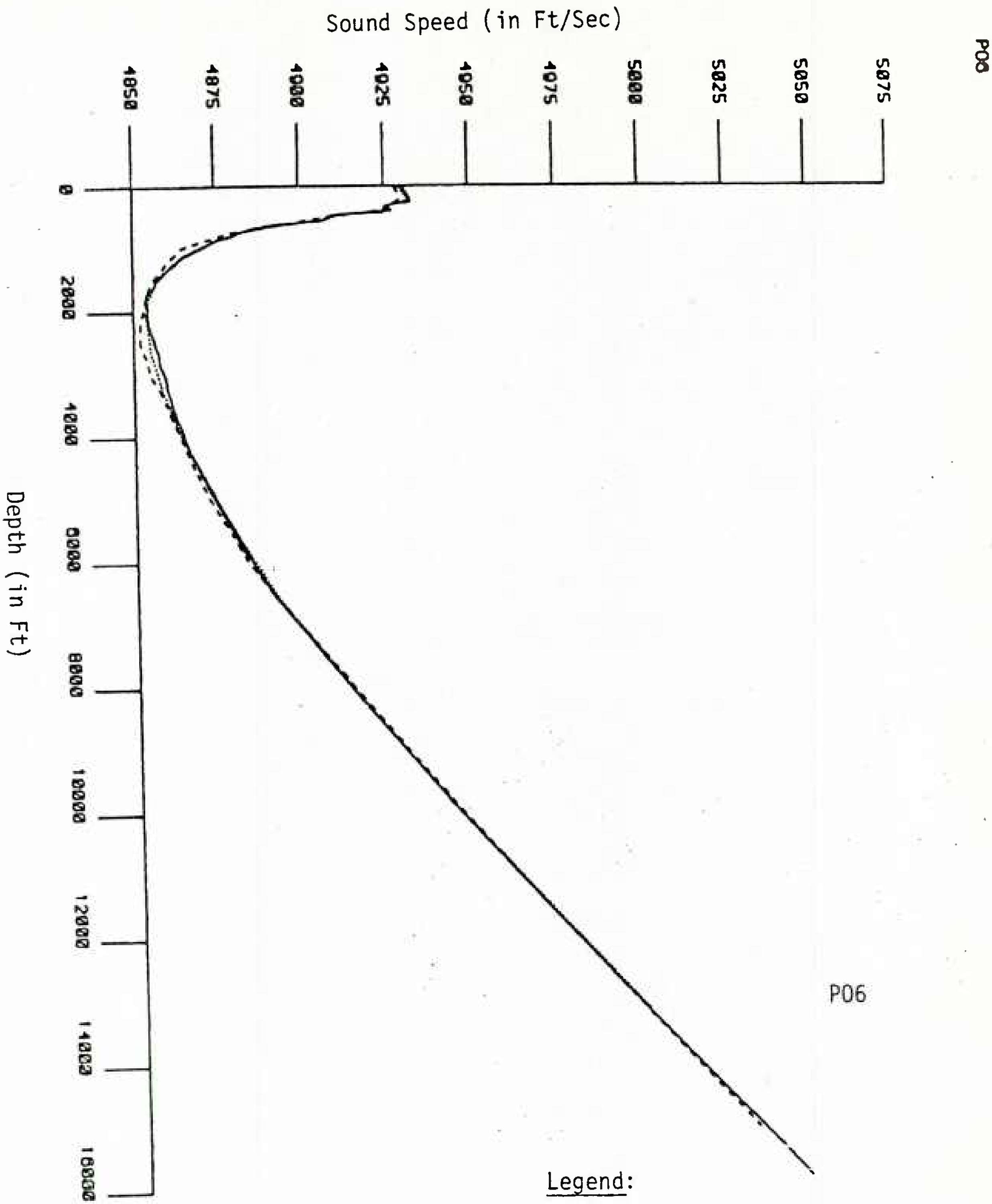

Sound Speed (in Ft/Sec)
4825
4850
4875
4900
4925
4950
4975
5000
5025
5050
P05
0
2000
4000
6000
8000
10000
12000
14000
16000
Depth (in Ft)
P05
Legend:
CTD
ICAPS
SIMAS
36°40'N
APRIL
154°00'E

FIGURE 12



Legend:

______ STD

...... ICAPS

------ SIMAS

35°00'N

MARCH

130°1.4'W

FIGURE 13

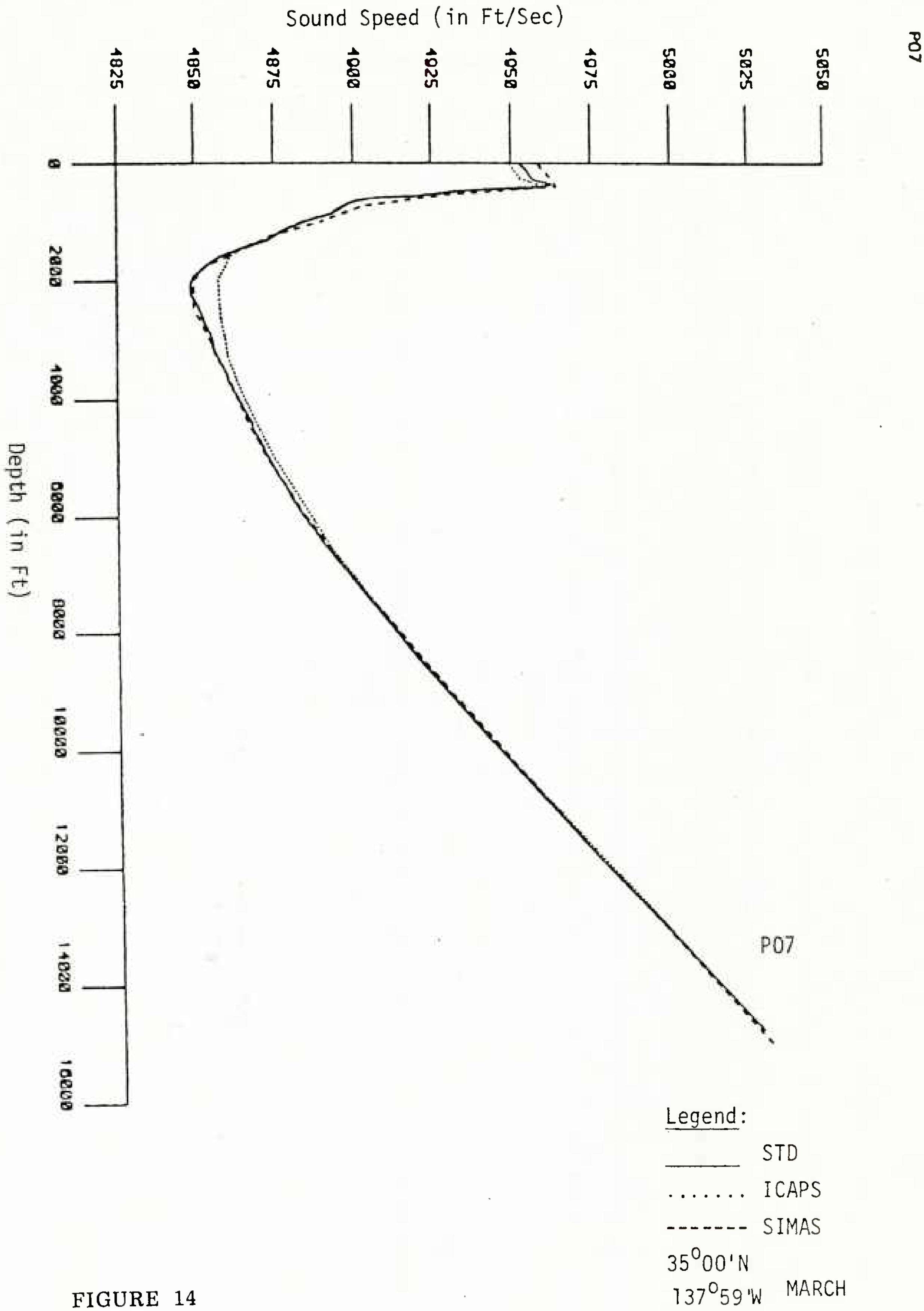
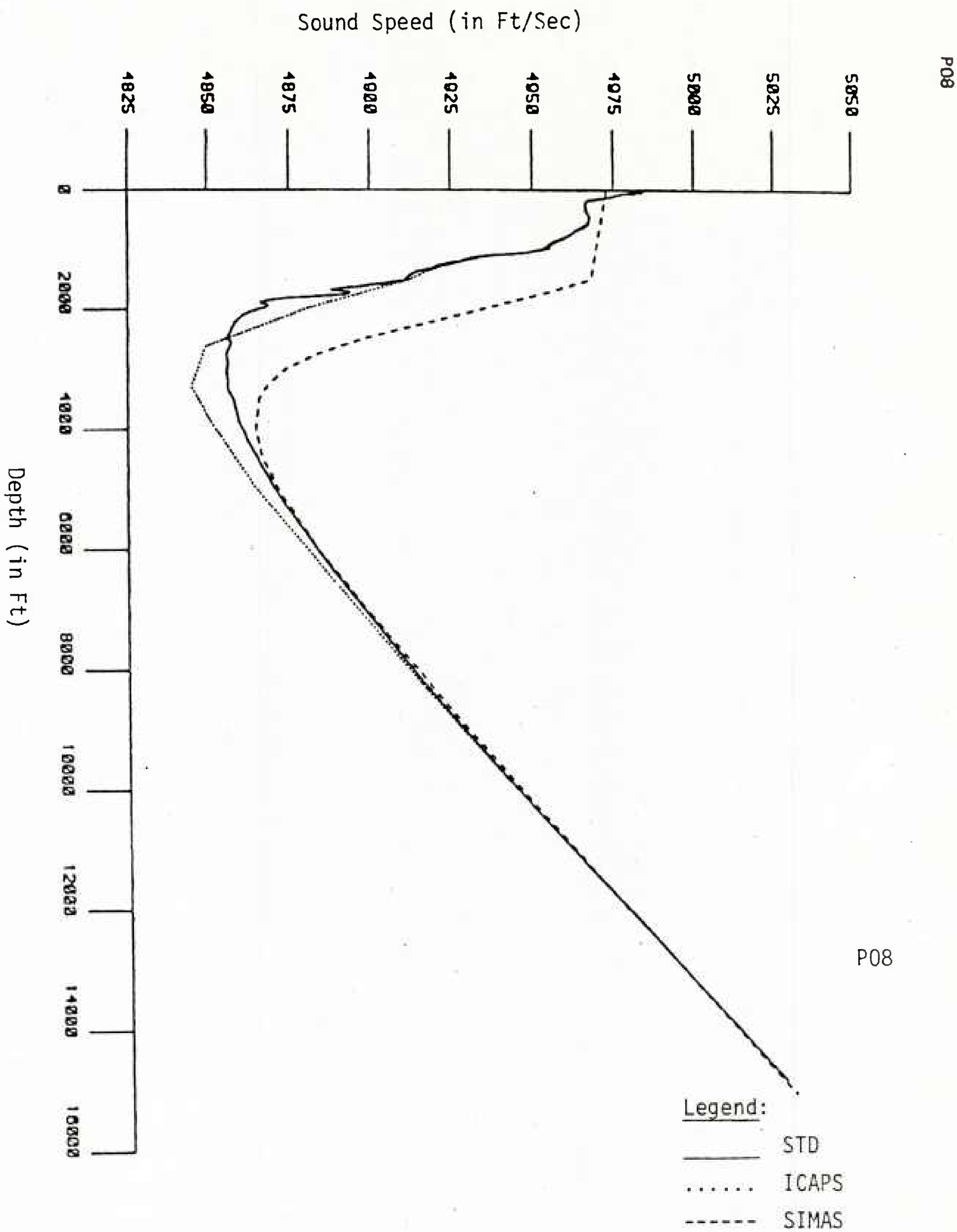

P07
Sound Speed (in Ft/Sec)
4825
4850
4875
4900
4925
4950
4975
5000
5025
5050
Depth (in Ft)
0
2000
4000
6000
8000
10000
12000
14000
16000
P07
Legend:
STD
ICAPS
SIMAS
35°00'N
137°59'W
MARCH

FIGURE 14



$34^o56.5'N$
APRIL
$147^o59.4'W$

FIGURE 15

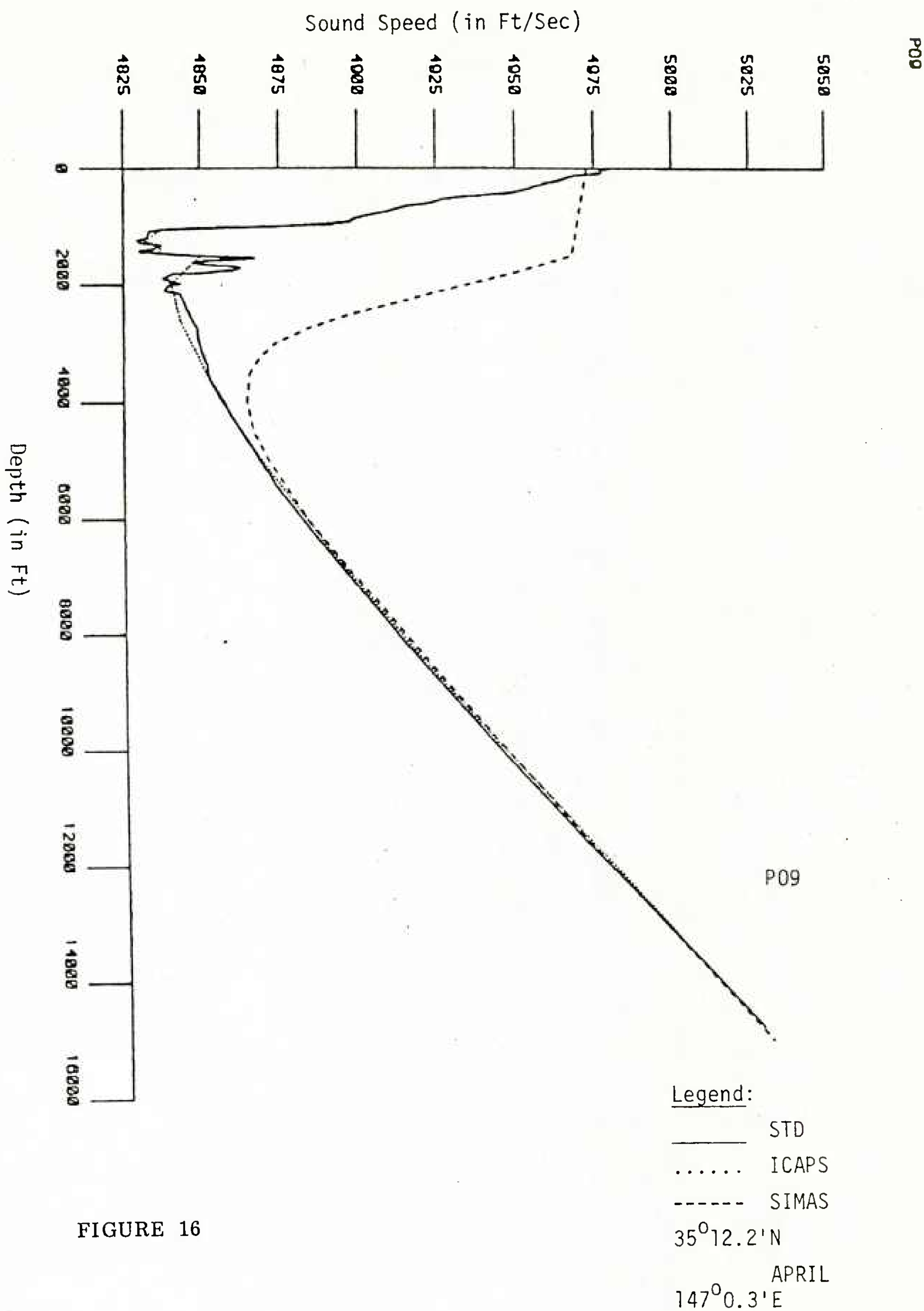

P09
Sound Speed (in Ft/Sec)
4825
4850
4875
4900
4925
4950
4975
5000
5025
5050
Depth (in Ft)
0
2000
4000
6000
8000
10000
12000
14000
16000
P09
Legend:
STD
ICAPS
SIMAS
35°12.2'N
APRIL
147°0.3'E

FIGURE 16

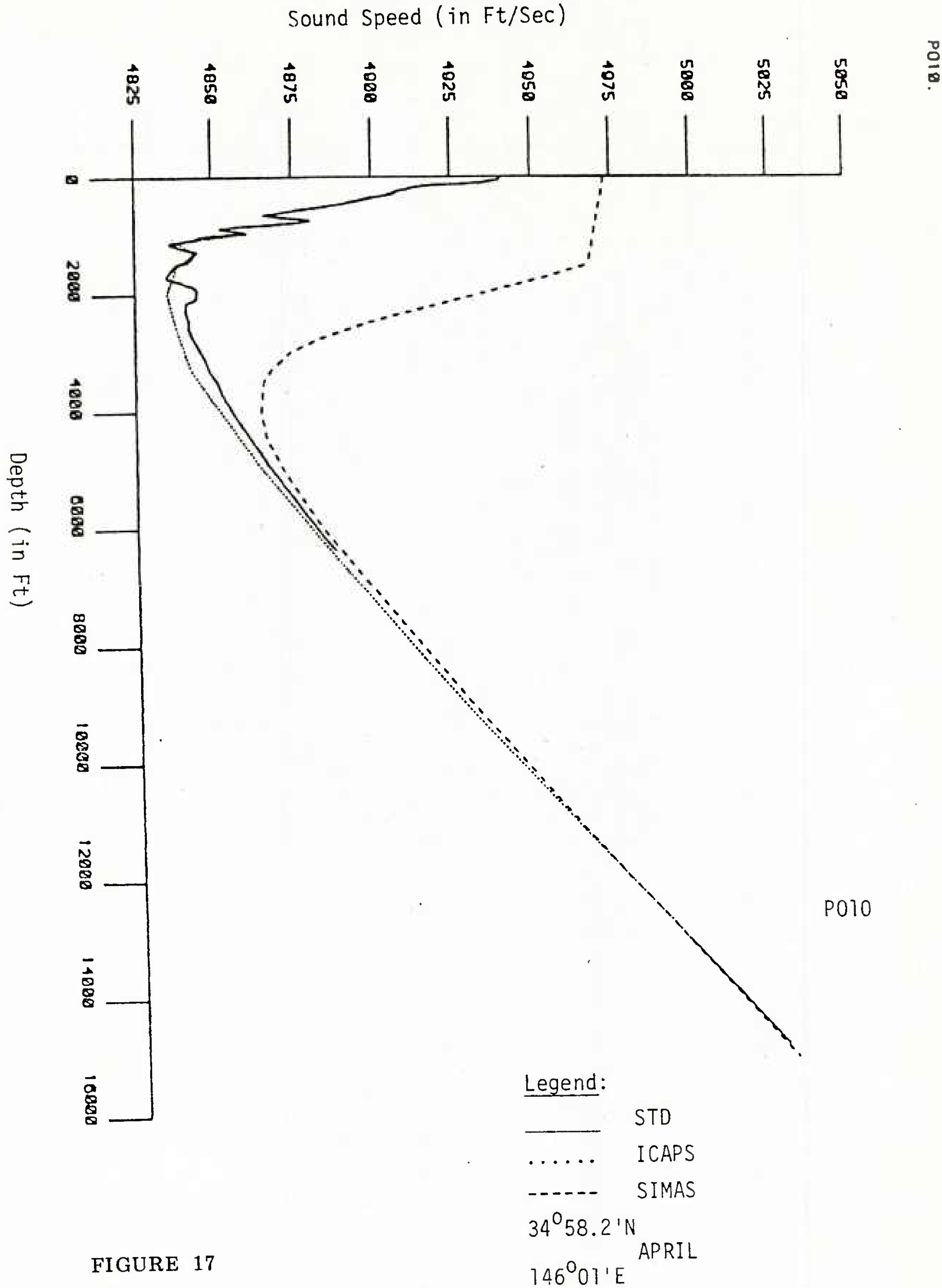
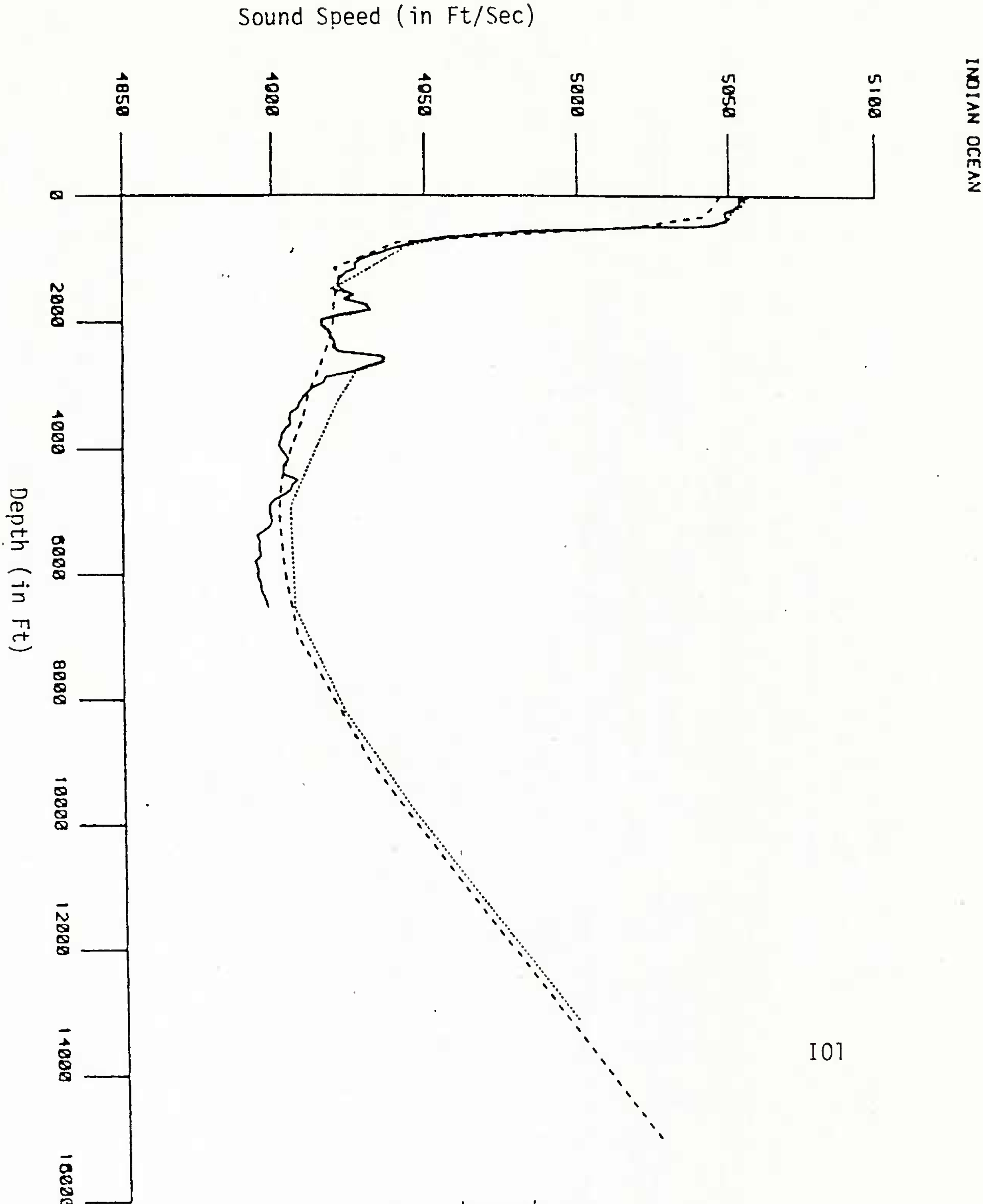

Sound Speed (in Ft/Sec)
4825
4850
4875
4900
4925
4950
4975
5000
5025
5050
P010.
Depth (in Ft)
0
2000
4000
6000
8000
10000
12000
14000
16000
P010
Legend:
STD
ICAPS
SIMAS
34°58.2'N
APRIL
146°01'E

FIGURE 17



Legend:

CTD

ICAPS

SIMAS

4°49'N

MARCH

053°02'E

FIGURE 18

TABLE (I) DESIGNATORS & LOCATIONS OF SELECTED SITES FOR SIMAS, ICAPS AND CTD/STD COMPARISONS

North Pacific Ocean	Latitude	Longitude	Month
P01	43°00'N	158°02'W	(September)
P02	35°59'N	158°00'W	(October)
P03	27°20'N	154°01'E	(April)
P04	33°18'N	154°03'E	(April)
P05	36°40'N	154°00'E	(April)
P06	35°00'N	130°1.4'W	(March)
P07	35°00'N	137°59'W	(March)
P08	34°56.5'N	147°59.4'W	(March)
P09	35°12.2'N	147°0.3'E	(April)
P10	34°58.2'N	146°01'E	(April)
Indian Ocean			
I01	4°49'N	053°02'E	(March)
North Atlantic Ocean			
A01	37°00'N	018°00'W	(February)
A02	36°00'N	019°00'W	(February)
A03	35°22.7'N	035°4.7'W	(June)
A04	35°12.4'N	054°59.0'W	(July)
A05	30°24.6'N	071°57.8'W	(September)
A06	30°25.6'N	071°57.0'W	(September)

TABLE (II)

Sources for the CTD and STD Test Cases

I. Scripps Institute for Oceanography

a) CTD
J. Reid and K. Kenyon P01, P02, P03, P04, P05

b) STD
J. Reid and K. Kenyon P06, P07, P08, P09, P10

II. Woods Hole Oceanographic Institute

a) CTD
M. McCartney A05, A06

III. Naval Ocean Research and Development Activity

a) CTD
H. Perkins and D. Fenner A01, A02, I01

IV. Naval Oceanographic Office

a) CTD
LCDR L. Danzler A03, A04

TABLE III. Numerical values of $\overrightarrow{SS}$ (in feet/sec) at the surface, and quantitative differences in $\overline{SS}$ (in feet/sec) at the surface.

Point Identifier	Point Location	Values of $\overrightarrow{SS}$ (in ft/sec) at the surface			Differences in $\overrightarrow{SS}$ (in ft/sec) at the surface	
		SIMAS	ICAPS	Assumed Oceanography	SIMAS-Assumed Oceanography	ICAPS-Assumed Oceanography
A01	$37^{\circ}00'$N $018^{\circ}00'$W	4965.95	4955.65	4955.65	10.00	not applicable
A02	$36^{\circ}00'$N $019^{\circ}00'$W	4965.95	4953.68	4953.02	12.93	.66
A03	$35^{\circ}22.7'$N $035^{\circ}4.7'$W	5007.00	5008.14	5008.47	-1.47	-0.33
A04	$35^{\circ}12.4'$N $054^{\circ}59'$W	5034.70	5036.03	5037.01	-2.31	-0.98
A05	$30^{\circ}24.6'$N $071^{\circ}57.8'$W	5059.50	5059.65	5060.30	-0.80	-0.65
A06	$30^{\circ}25.6'$N $071^{\circ}57'$W	5056.90	5057.35	5057.68	-0.78	-0.33
P01	$43^{\circ}00'$N $158^{\circ}02'$W	4951.84	4954.34	4953.35	-1.51	0.99
P02	$35^{\circ}59'$N $158^{\circ}00'$W	5014.93	5005.19	5002.89	12.04	2.30
P03	$27^{\circ}20'$N $154^{\circ}01'$E	4994.43	4999.61	4998.63	-4.20	0.98
P04	$33^{\circ}18'$N $154^{\circ}03'$E	4974.94	4945.15	4944.49	30.45	0.66
P05	$36^{\circ}40'$N $154^{\circ}00'$E	4938.95	4953.35	4952.37	-13.42	0.98
P06	$35^{\circ}00'$N $130^{\circ}1.4'$W	4927.73	4929.40	4930.39	-2.66	-0.99
P07	$35^{\circ}00'$N $137^{\circ}59'$W	4958.44	4949.41	4952.66	5.78	-3.25
P08	$34^{\circ}56.5'$N $147^{\circ}59.4'$W	4972.94	4983.54	4983.40	-10.46	0.14
P09	$35^{\circ}12.2'$N $147^{\circ}0.3'$E	4972.94	4979.27	4979.60	-6.66	-0.33
P10	$34^{\circ}58.2'$N $146^{\circ}01'$E	4972.94	4940.55	4940.10	32.84	0.45
I01	$4^{\circ}49'$N $053^{\circ}02'$E	5047.40	5056.70	5055.05	-7.65	1.65

TABLE IV. Numerical values of $\overrightarrow{SS}$ (in feet/sec at the layer, and quantitative differences in $\overrightarrow{SS}$ (in feet/sec) at the layer.

Point Identifier	Point Location	Values of $\overrightarrow{SS}$ (in ft/sec) at the layer			Differences in $\overrightarrow{SS}$ (in ft/sec) at the layer	
		SIMAS	ICAPS	Assumed Oceanography	SIMAS-Assumed Oceanography	ICAPS-Assumed Oceanography
A01	37°00'N 018°00'W	4967.75	4959.91	4959.26	8.49	.65
A02	36°00'N 019°00'W	4965.95	4954.99	4954.66	11.29	.33
A03	35°22.7'N 035°4.7'W	5008.10	5009.13	5009.13	-1.03	0
A04	35°12.4'N 054°59'W	5035.90	5036.68	5037.01	-1.11	-.33
A05	30°24.6'N 071°57.8'W	5060.10	5059.65	5060.63	-.53	-.98
A06	30°25.6'N 071°57'W	5059.10	5060.30	5059.98	-.88	.32
P01	43°00'N 158°02'W	4952.14	4954.34	4954.01	-1.87	.33
P02	35°59'N 158°00'W	5015.32	5005.52	5003.88	11.44	1.64
P03	27°20'N 154°01'E	4994.43	4999.61	4998.63	-4.20	.98
P04	33°18'N 154°03'E	4975.92	4945.48	4945.48	30.44	0
P05	36°40'N 154°00'E	4939.25	4953.35	4952.37	-13.12	.98
P06	35°00'N 130°1.4'W	4930.02	4932.03	4932.85	-2.83	-.82
P07	35°00'N 137°59'W	4964.05	4958.93	4962.44	1.61	-3.51
P08	34°56.5'N 147°59.4'W	4972.94	4984.19	4983.86	-10.92	.33
P09	35°12.2'N 147°0.3'E	4972.94	4976.97	4979.83	-6.89	-2.86
P10	34°58.2'N 146°01'E	4973.04	4940.55	4940.59	32.45	-.04
I01	4°49'N 053°02'E	5047.40	5056.70	5055.71	-8.31	.99

TABLE V. Numerical values of $\overrightarrow{SS}$ (in feet/sec) at 1000 feet, and quantitative differences in $\overrightarrow{SS}$ (in feet/sec) at 1000 feet.

Point Identifier	Point Location	Values of $\overrightarrow{SS}$ (in ft/sec) at 1000 feet			Differences in $\overrightarrow{SS}$ (in ft/sec) at 1000 feet	
		SIMAS	ICAPS	Assumed Oceanography	SIMAS-Assumed Oceanography	ICAPS-Assumed Oceanography
A01	37°00'N 018°00'W	4945.94	4936.50	4936.62	9.32	-0.12
A02	36°00'N 019°00'W	4945.94	4936.49	4935.75	10.19	0.74
A03	35°22.7'N 035°4.7'W	4960.0	4944.12	4943.80	16.20	0.32
A04	35°12.4'N 054°59'W	4992.0	4993.96	4994.61	-2.61	-0.65
A05	30°24.6'N 071°57.8'W	4999.0	5000.40	5000.11	-1.11	0.29
A06	30°25.6'N 071°57'W	4999.0	5001.46	5001.10	-2.10	0.36
P01	43°00'N 158°02'W	4856.93	4862.6	4862.38	-5.45	0.22
P02	35°59'N 158°00'W	4917.95	4901.28	4899.10	18.85	2.18
P03	27°20'N 154°01'E	4955.94	4959.81	4959.24	-3.30	0.57
P04	33°18'N 154°03'E	4971.20	4889.64 4889.64	4886.54	84.66	3.10
P05	36°40'N 154°00'E	4886.95	4909.85	4906.91	-19.96	2.94
P06	35°00'N 130°1.4'W	4864.93	4870.33	4871.22	-6.29	-0.89
P07	35°00'N 137°59'W	4889.93	4884.20	4884.96	4.97	-0.76
P08	34°56.5'N 147°59.4'W	4969.62	4954.44	4953.18	16.44	1.26
P09	35°12.2'N 147°0.3'E	4969.61	4873.60	4880.59	89.02	-6.99
P10	34°58.2'N 146°01'E	4969.73	4856.26	4853.29	116.44	2.97
I01	4°49'N 053°02'E	4928.0	4937.12	4929.55	-1.55	7.57

TABLE VI. Numerical values of $\vec{SS}$ (in feet/sec) at the channel axis, quantitative differences in $\vec{SS}$ (in feet/sec) at the channel axis.

Point Identifier	Point Location	Values of $\vec{SS}$ (in ft/sec) at the channel axis			Differences in $\vec{SS}$ (in ft/sec) at the channel axis	
		SIMAS	ICAPS	Assumed Oceanography	SIMAS-Assumed Oceanography	ICAPS-Assumed Oceanography
A01	37°00'N 018°00'W	4926.94	4924.15	4917.92	9.02	6.23
A02	36°00'N 019°00'W	4926.94	4924.15	4916.28	10.66	7.87
A03	35°22.7'N 035°4.7'W	4915.00	4902.83	not applicable	not applicable	not applicable
A04	35°12.4'N 054°59'W	4888.00	4888.39	not applicable	not applicable	not applicable
A05	30°24.6'N 071°57.8'W	4891.00	4899.55	4895.94	-4.94	3.61
A06	30°25.6'N 071°57'W	4891.00	4899.22	4896.92	-5.92	2.30
P01	43°00'N 158°02'W	not applicable			not applicable	not applicable
P02	35°59'N 158°00'W	4853.95	4861.49	4849.68	4.27	11.81
P03	27°20'N 154°01'E	4861.95	4859.52	4856.89	5.06	2.63
P04	33°18'N 154°03'E	4864.93	4844.43	4844.76	20.17	-.33
P05	36°40'N 154°00'E	4847.94	4853.29	4851.32	-3.38	1.97
P06	35°00'N 130°1.4'W	4851.94	4853.61	4854.34	-2.40	-.73
P07	35°00'N 137°59'W	4849.94	4857.88	4848.82	1.12	9.06
P08	34°56.5'N 147°59.4'W	4864.93	4845.09	4855.98	8.95	-10.89
P09	35°12.2'N 147°0.3'E	4864.93	4840.82	4838.43	26.50	2.39
P10	34°58.2'N 146°01'E	4864.93	4835.24	4835.31	29.62	-.07
I01	4°49'N 053°02'E	4902.00	4905.78	4894.30	7.70	11.48

TABLE VII. Numerical values of layer depth (in feet), quantitative differences in the depths of the layer (in feet).

Point Identifier	Point Location	Values of the layer depth (in ft)			Differences in layer depth (in ft)	
		SIMAS	ICAPS	Assumed Oceanography	SIMAS-Assumed Oceanography	ICAPS-Assumed Oceanography
A01	37°00'N 018°00'W	108.30	337.92	367.45	-259.15	-29.53
A02	36°00'N 019°00'W	0	154.20	387.13	-387.13	-232.93
A03	35°22.7'N 035°4.7'W	65.90	65.62	65.62	.28	0
A04	35°12.4'N 054°59'W	24.6	36.09	0	24.60	36.09
A05	30°24.6'N 071°57.8'W	36.10	65.62	32.81	3.29	32.81
A06	30°25.6'N 071°57'W	88.60	88.58	88.58	.02	0
P01	43°00'N 158°02'W	78.71	0	88.58	-9.87	-88.58
P02	35°59'N 158°00'W	78.71	127.95	98.42	-19.71	29.53
P03	27°20'N 154°01'E	0.0	0.0	0.0	0	0
P04	33°18'N 154°03'E	59.09	78.74	49.21	9.88	29.53
P05	36°40'N 154°00'E	19.68	0.0	98.42	-78.74	-98.42
P06	35°00'N 130°1.4'W	205.71	206.69	225.57	-19.86	-18.88
P07	35°00'N 137°59'W	401.90	367.45	368.11	33.79	-.66
P08	34°56.5'N 147°59.4'W	2.0	36.09	37.73	-35.73	-1.64
P09	35°12.2'N 147°0.3'E	0	36.09	13.12	-13.12	22.97
P10	34°58.2'N 146°01'E	70.90	68.90	39.37	31.53	29.53
I01	4°49'N 053°02'E	0	0	9.84	-9.84	-9.84

TABLE VIII. Numerical values of the channel axis depth (in feet), quantitative differences in the depths of the channel axis (in feet).

Point Identifier	Point Location	Values of the channel axis depth (in ft)			Differences in the channel axis (in ft) depth	
		SIMAS	ICAPS	Assumed Oceanography	SIMAS-Assumed Oceanography	ICAPS-Assumed Oceanography
A01	37°00'N 018°00'W	6999.91	6561.60	5721.71	438.31	839.89
A02	36°00'N 019°00'W	6999.91	6561.60	5600.32	1399.58	961.28
A03	35°22.7'N 035°4.7'W	5000.00	4429.08	not applicable	not applicable	not applicable
A04	35°12.4'N 054°59'W	4000.00	3936.96	not applicable	not applicable	not applicable
A05	30°24.6'N 071°57.8'W	4500.00	3936.96	4268.32	231.68	-331.36
A06	30°25.6'N 071°57'W	4500.00	3936.96	4248.64	251.36	-311.68
P01	43°00'N 158°02'W	not	applicable		not applicable	not applicable
P02	35°59'N 158°00'W	2749.97	2624.64	2618.08	131.89	6.56
P03	27°20'N 154°01'E	3499.96	3280.80	3257.83	242.13	22.97
P04	33°18'N 154°03'E	3999.95	2624.64	2145.64	1854.31	479.00
P05	36°40'N 154°00'E	2499.97	2624.64	2627.92	-127.95	-3.28
P06	35°00'N 130°1.4'W	2374.97	1968.48	2059.36	315.61	-90.88
P07	35°00'N 137°59'W	2249.97	1968.48	2060.01	189.96	-91.53
P08	34°56.5'N 147°59.4'W	3999.95	3280.80	3058.03	941.92	941.92
P09	35°12.2'N 147°0.3'E	3999.95	1968.48	2089.87	1910.08	-121.39
P10	34°58.2'N 146°01'E	3999.95	1968.48	1712.91	2287.04	255.57
I01	4°49'N 053°02'E	5000.00	4921.20	5800.78	-800.78	-879.58

TABLE (IX)

Qualitative Differences in $\overrightarrow{SS}$ at the surface

LEGEND: slight < 1 f/s
1 f/s $< \overrightarrow{SS} < 7$ f/s
7 f/s $< \overrightarrow{SS}^{*} < 20$ f/s
20 f/s $< \overrightarrow{SS}^{**} < 40$ f/s

SITE (ID)	Differences in SS at the surface	
	SIMAS	ICAPS
A01	$\overrightarrow{SS}$*	none
A02	$\overrightarrow{SS}$*	slight
A03	$\overrightarrow{SS}$	slight
A04	$\overrightarrow{SS}$	slight
A05	slight	slight
A06	slight	slight
P01	$\overrightarrow{SS}$	slight
P02	$\overrightarrow{SS}$*	$\overrightarrow{SS}$
P03	$\overrightarrow{SS}$	slight
P04	$\overrightarrow{SS}$**	slight
P05	$\overrightarrow{SS}$*	slight
P06	$\overrightarrow{SS}$	slight
P07	$\overrightarrow{SS}$	SS
P08	$\overrightarrow{SS}$*	slight
P09	$\overrightarrow{SS}$	slight
P10	$\overrightarrow{SS}$**	slight
I01	$\overrightarrow{SS}$*	$\overrightarrow{SS}$

TABLE (X)

Qualitative Differences in $\vec{SS}$ at the layer

LEGEND: slight < 1 f/s
1 f/s < SSL < 7 f/s
7 f/s < SSL* < 20 f/s
20 f/s < SSL** < 40 f/s

SITE (ID)	Differences in SS at the layer	
	SIMAS	ICAPS
A01	SSL*	slight
A02	SSL*	slight
A03	SSL	none
A04	SSL	slight
A05	slight	slight
A06	slight	slight
P01	SSL	slight
P02	SSL*	SSL
P03	SSL	slight
P04	SSL**	none
P05	SSL*	slight
P06	SSL	slight
P07	SSL	SSL
P08	SSL*	slight
P09	SSL	SSL
P10	SSL**	slight
I01	SSL*	slight

TABLE (XI)

Qualitative Differences in $\overrightarrow{SS}$ at 1000 feet

LEGEND:
slight < 1 f/s
1 f/s < SS1000 < 6 f/s
6 f/s < SS1000* < 12 f/s
12 f/s < SS1000** < 20 f/s
20 f/s < SS1000*** < 75 f/s
75 f/s < SS1000**** < 100 f/s
100 f/s < SS1000*****

SITE (ID)	Differences in SS at the 1000' feet	
	SIMAS	ICAPS
A01	SS1000*	slight
A02	SS1000*	slight
A03	SS1000**	slight
A04	SS1000	slight
A05	SS1000	slight
A06	SS1000	slight
P01	SS1000	slight
P02	SS1000**	SS1000
P03	SS1000	slight
P04	SS1000***	SS1000
P05	SS1000**	SS1000
P06	SS1000*	slight
P07	SS1000	slight
P08	SS1000**	SS1000
P09	SS1000****	SS1000*
P10	SS1000*****	SS1000*
I01	SS1000	SS1000*

TABLE (XII)

Qualitative Differences in $\overrightarrow{SS}$ at the channel axis

LEGEND:
_ ___ = no comparison made
slight < 1 f/s
1 f/s < SSCA < 3 f/s
3 f/s < SSCA* < 7 f/s
7 f/s < SSCA** < 12 f/s
12 f/s < SSCA*** < 20 f/s
20 f/s < SSCA****

SITE (ID)	Differences in SS at the channel axis	
	SIMAS	ICAPS
A01	SSCA**	SSCA**
A02	SSCA**	SSCA**
A03	--	--
A04	--	--
A05	SSCA*	SSCA*
A06	SSCA*	SSCA*
P01	--	--
P02	SSCA*	SSCA**
P03	SSCA*	SSCA
P04	SSCA****	slight
P05	SSCA*	SSCA
P06	SSCA	slight
P07	SSCA	SSCA**
P08	SSCA**	SSCA**
P09	SSCA****	SSCA
P10	SSCA****	slight
I01	SSCA**	SSCA**

TABLE (XIII)

Qualitative Differences in $\overrightarrow{SS}$ at the layer depth

LEGEND: slight < 2 ft
2 ft < DLD < 30 ft
30 ft < DLD* < 90 ft
90 ft < DLD** < 150 ft
150 ft < DLD*** < 250 ft
250 ft < DLD****

SITE (ID)	Differences in layer depth (in feet)	
	SIMAS	ICAPS
A01	DLD****	DLD
A02	DLD****	DLD***
A03	slight	none
A04	DLD	DLD*
A05	DLD	DLD*
A06	slight	none
P01	DLD	DLD*
P02	DLD	DLD
P03	none	none
P04	DLD	DLD
P05	DLD*	DLD**
P06	DLD	DLD
P07	DLD*	DLD
P08	DLD*	DLD
P09	DLD	DLD
P10	DLD*	DLD
I01	DLD	DLD

TABLE (XIV)

Qualitative Differences in the depth of the channel axis

LEGEND:

---- = no comparisons made

0 ft < DSCA < 300 ft

300 ft < DSCA* < 600 ft

600 ft < DSCA** < 1200 ft

1200 ft < DSCA*** < 2000 ft

2000 ft < DSCA****

SITE (ID)	Differences in the depth of sound channel axis (in feet)	
	SIMAS	ICAPS
A01	DSCA*	DSCA**
A02	DSCA***	DSCA**
A03	--	--
A04	--	--
A05	DSCA	DSCA*
A06	DSCA	DSCA**
P01	--	--
P02	DSCA	DSCA
P03	DSCA	DSCA
P04	DSCA***	DSCA*
P05	DSCA	DSCA
P06	DSCA*	DSCA
P07	DSCA	DSCA
P08	DSCA**	DSCA**
P09	DSCA***	DSCA
P10	DSCA****	DSCA
I01	DSCA**	DSCA**

TABLE (XV). Numerical values of sound speeds (in feet/sec) for "assumed oceanography" profiles

ATLANTIC OCEAN

A01

0.00	4955.65	209.97	4957.29	367.45	4959.26	374.01	4958.60
380.57	4957.29	387.13	4955.98	393.70	4954.01	410.10	4952.70
413.38	4951.05	416.66	4949.41	423.22	4948.10	429.78	4946.79
436.35	4945.15	452.75	4943.51	479.00	4942.20	498.68	4942.85
544.61	4941.21	580.70	4939.57	646.32	4940.23	685.69	4938.59
738.18	4937.93	800.52	4941.54	810.36	4938.59	830.04	4939.90
853.01	4938.26	869.41	4935.30	902.22	4935.30	954.71	4934.00
1000.64	4936.62	1026.89	4934.98	1059.70	4932.03	1092.51	4934.32
1187.65	4933.34	1263.11	4934.65	1407.46	4933.34	1446.83	4931.70
1614.15	4933.01	1886.46	4934.65	2116.12	4937.61	2185.01	4935.96
2263.75	4938.91	2309.68	4938.26	2316.24	4936.62	2378.58	4935.96
2536.06	4938.26	2641.32	4935.30	2683.69	4938.26	2726.34	4937.61
2729.63	4936.95	2772.28	4938.59	2782.12	4940.55	2818.21	4942.85
2847.73	4941.21	2877.26	4942.20	2887.10	4945.48	2916.63	4945.48
2939.60	4943.84	2949.44	4941.21	2995.37	4943.18	3067.55	4944.82
3070.83	4945.15	3074.11	4946.79	3077.39	4948.43	3129.88	4950.40
3159.41	4948.43	3205.34	4951.38	3366.10	4954.66	3625.28	4955.98
3999.29	4952.70	4081.31	4949.41	4205.98	4946.13	4432.36	4942.85
4488.13	4939.90	4563.59	4936.62	4694.82	4933.34	4819.50	4930.06
5006.50	4926.78	5173.82	4923.50	5337.86	4920.54	5721.71	4917.92
6184.31	4919.23	6440.21	4919.56	6561.60	4921.20	8202.00	4936.62
9842.40	4958.93	11482.80	4984.19	13123.20	5010.77	14763.60	5038.00
16404.00	5066.87	16640.22	5071.13				

¤

ATLANTIC OCEAN

A 02

0.00	4953.02	387.13	4954.66	413.38	4953.68	416.66	4953.02
419.94	4952.37	429.78	4952.04	446.19	4950.40	456.03	4948.76
465.87	4947.45	475.72	4945.80	495.40	4944.16	528.21	4942.52
570.86	4940.88	652.88	4940.23	728.34	4941.87	764.43	4943.51
816.92	4941.87	836.60	4940.23	859.57	4938.59	902.22	4936.95
1036.73	4935.30	1151.56	4933.67	1561.66	4933.01	1761.79	4934.65
1863.49	4936.29	1978.32	4937.93	2050.50	4939.57	2076.75	4941.21
2142.36	4942.85	2194.86	4944.49	2250.63	4946.13	2316.24	4947.77
2388.42	4949.41	2460.60	4951.05	2532.78	4952.70	2647.61	4954.34
2726.34	4954.99	2811.65	4953.68	2847.73	4955.32	3087.23	4956.96
3146.29	4954.66	3477.65	4956.30	3602.32	4957.95	3871.34	4957.95
4051.79	4956.30	4120.68	4954.66	4140.37	4953.02	4228.95	4949.74
4304.41	4946.46	4389.71	4943.18	4478.29	4940.23	4550.47	4936.95
4635.77	4933.67	4671.86	4930.39	4763.72	4927.43	4917.92	4925.79
4924.48	4924.81	4993.38	4923.17	5068.84	4921.53	5180.38	4919.89
5452.69	4918.25	5600.32	4916.28	5688.91	4917.92	5967.77	4919.56
6151.50	4921.20	6299.14	4922.84	6492.70	4924.48	6561.60	4925.46
7611.46	4937.61	8202.00	4940.55	8320.11	4940.88	9842.40	4959.26
11482.80	4984.52	13123.20	5010.77	14763.60	5038.00	16404.00	5066.87
16879.71	5075.40						

ATLANTIC OCEAN

A 03

0.00	5008.47	42.65	5008.47	65.62	5009.13	88.58	5006.17
108.27	4986.82	131.23	4977.30	177.16	4970.74	200.13	4965.49
249.34	4960.24	272.31	4957.95	341.20	4957.29	508.52	4953.68
705.37	4951.71	744.74	4952.04	912.06	4948.10	997.36	4943.84
1174.53	4940.88	1213.90	4939.25	1430.43	4935.64	1601.03	4934.32
1728.98	4931.37	1856.93	4928.09	1899.58	4928.42	2109.55	4925.14
2283.44	4922.18	2326.09	4919.56	2447.48	4917.26	2828.05	4917.26
2956.00	4916.28	3038.02	4915.95				

A 04

0.00	5037.01	36.09	5037.01	52.49	5031.43	72.18	5024.87
95.14	5012.08	121.39	5004.86	147.64	4998.95	177.16	4995.02
246.06	4989.77	390.42	4988.13	790.67	4991.41	1026.89	4995.02
1259.83	4997.64	1312.32	4995.34	1414.02	4990.43	1512.45	4986.49
1610.87	4982.88	1706.02	4978.61	1801.16	4974.68	1899.58	4969.75
1984.73	4966.47	2093.15	4960.90	2139.08	4957.62	2237.51	4952.37
2283.44	4948.43	2381.86	4943.18	2431.07	4939.90	2526.22	4934.65
2621.36	4929.07	2670.57	4924.48	2719.78	4921.53	2765.71	4917.92

A 05

0.00	5060.30	13.12	5060.30	32.81	5060.63	82.02	5059.32
108.27	5057.35	121.39	5054.07	124.67	5052.10	127.95	5049.81
131.23	5046.20	134.51	5043.25	141.07	5040.29	147.64	5038.00
154.20	5035.04	157.48	5033.40	160.76	5031.11	173.88	5027.82
183.72	5025.53	196.85	5022.91	206.69	5019.95	229.66	5017.33
242.78	5014.05	265.74	5011.42	282.15	5009.13	305.11	5005.84
383.85	5002.56	567.58	4999.28	639.76	4998.63	744.74	4999.61
793.95	4999.28	938.31	5000.27	967.84	4999.94	1515.73	5002.89
1604.31	5002.89	1745.39	4999.61	1843.81	4996.33	1909.43	4993.05
1975.04	4989.77	2043.94	4986.82	2086.59	4983.54	2185.01	4980.25
2244.07	4976.97	2306.40	4973.69	2349.05	4970.41	2394.98	4967.13
2460.60	4963.85	2509.81	4960.57	2565.59	4957.29	2608.24	4954.01
2667.29	4950.73	2706.66	4947.45	2755.87	4944.16	2798.52	4941.21
2844.45	4937.61	2873.98	4934.65	2919.91	4931.70	2942.88	4928.42
3018.34	4925.14	3064.27	4921.86	3123.32	4919.56	3185.66	4915.95
3228.31	4912.67	3307.05	4909.72	3392.35	4906.44	3503.89	4903.16
3654.81	4899.88	3835.26	4896.59	3959.93	4897.58	4084.60	4896.59
4130.53	4897.25	4150.21	4896.27	4183.02	4897.58	4268.32	4895.94
4868.71	4899.22	5249.28	4902.50				

¤

A 06

0.00	5057.68	13.12	5057.68	82.02	5059.32	88.58	5059.98
91.86	5059.32	95.14	5058.34	98.42	5055.71	101.70	5053.41
104.99	5050.46	111.55	5047.84	124.67	5044.56	131.23	5041.28
144.36	5038.00	160.76	5034.71	173.88	5031.76	180.44	5029.46
190.29	5028.51	200.13	5024.21	206.69	5021.27	219.81	5017.98
239.50	5015.03	262.46	5012.08	291.99	5008.80	344.48	5005.52
462.59	5002.56	521.65	4999.94	1200.77	5001.58	1686.33	5003.22
1811.00	4999.94	1906.14	4996.66	1961.92	4993.38	2020.97	4990.10
2080.03	4986.82	2135.80	4983.86	2198.14	4980.58	2263.75	4977.63
2335.93	4974.35	2381.86	4971.07	2427.79	4968.11	2467.16	4964.83
2513.09	4961.88	2552.46	4958.93	2611.52	4955.65	2654.17	4952.37
2686.98	4948.76	2723.06	4945.80	2769.00	4942.52	2824.77	4938.91
2854.30	4935.96	2900.23	4932.68	2959.28	4929.40	3015.06	4926.12
3074.11	4922.84	3123.32	4919.56	3208.62	4916.28	3277.52	4913.32
3375.94	4910.04	3408.75	4906.77	3480.93	4903.81	3566.23	4900.53
3723.71	4897.58	3795.89	4898.56	4002.58	4896.92	4028.82	4897.58
4248.64	4896.92	4530.79	4898.23	4894.95	4901.52	5006.50	4900.86
5246.00	4902.50						

¤

PACIFIC OCEAN

P01

0 00	4953.35	88.58	4954.01	98.42	4953.02	108.27	4949.74
118 11	4941.87	127.95	4930.71	137.79	4919.23	147.64	4910.70
157 48	4905.45	167.32	4902.83	196.85	4899.55	236.22	4899.88
275 59	4897.25	285.43	4895.61	305.11	4892.00	324.80	4889.38
344.48	4886.09	354.33	4884.13	364.17	4881.17	374.01	4878.22
383.85	4875.27	403.54	4871.00	413.38	4870.02	462.59	4873.30
482.28	4875.60	501.96	4879.21	541.33	4880.85	620.07	4877.89
708.65	4874.61	757.86	4871.99	797.23	4869.04	875.97	4866.08
984.24	4863.13	1053.14	4859.85	1122.03	4856.24	1171.25	4853.61
1279.51	4850.34	1368.09	4847.38	1496.04	4844.10	1653.52	4842.46
1712.58	4842.46	1811.00	4843.12	1998.01	4842.13	2637.76	4845.41
3110.20	4848.37	3444.84	4851.64	3809.01	4854.93	4084.60	4857.88
4379.87	4861.16	4635.77	4864.11	4871.99	4867.07	4921.20	4867.72

¤

P02

0.00	5002.89	98.42	5003.88	147.64	5000.92	157.48	4996.66
167.32	4989.44	177.16	4979.60	187.01	4969.10	196.85	4959.91
206.69	4953.35	216.53	4948.76	226.38	4945.48	236.22	4942.85
246.06	4940.55	255.90	4937.93	265.74	4935.30	275.59	4932.68
285.43	4929.73	295.27	4926.78	305.11	4923.82	314.96	4920.87
324.80	4918.25	334.64	4915.62	344.48	4913.32	354.33	4911.36
364.17	4910.04	374.01	4909.39	393.70	4907.75	413.38	4907.09
511.80	4906.11	561.02	4909.39	610.23	4912.67	639.76	4913.32
738.18	4910.04	816.92	4906.77	905.50	4903.81	994.08	4900.53
1092.51	4897.25	1171.25	4894.30	1249.98	4891.34	1309.04	4888.06
1377.94	4884.78	1427.15	4881.83	1476.36	4878.88	1545.26	4875.93
1594.47	4872.97	1624.00	4870.35	1663.37	4867.07	1732.26	4864.11
1830.69	4861.16	1899.58	4858.21	2017.69	4854.93	2224.38	4851.64
2490.13	4850.00	2618.08	4849.68	3257.83	4852.30	3710.58	4855.58
4045.23	4858.86	4291.29	4862.14	4645.61	4865.43	4921.20	4868.71

¤

P03

0.00	4998.63	49.21	4995.34	98.42	4992.07	137.79	4985.50
157.48	4983.21	177.18	4980.25	196.85	4977.30	236.22	4974.35
324.80	4971.07	511.80	4968.77	757.86	4965.49	866.13	4962.54
984.24	4959.91	1053.14	4956.96	1112.19	4954.01	1181.09	4951.05
1259.83	4948.43	1299.20	4945.80	1338.57	4942.52	1387.78	4939.25
1427.15	4936.29	1476.36	4933.67	1515.73	4931.04	1555.10	4928.09
1584.63	4924.81	1604.31	4921.86	1633.84	4918.57	1692.89	4915.62
1722.42	4912.67	1751.95	4909.72	1781.47	4906.77	1820.81	4903.48
1860.21	4900.86	1899.58	4898.23	1929.11	4895.61	1958.64	4892.33
1998.01	4889.70	2017.69	4887.08	2037.38	4883.80	2066.90	4880.85
2116.12	4877.89	2175.17	4874.94	2263.75	4872.32	2312.96	4869.36
2431.07	4866.08	2490.13	4863.13	2568.87	4860.18	2657.45	4859.19
2716.50	4858.86	3228.31	4856.89	3287.36	4856.89	3769.64	4858.86
4143.65	4862.14	4625.93	4865.43	4921.20	4869.04		

¤

P04

0.00	4944.49	49.21	4945.48	108.27	4943.18	157.48	4942.52
246.06	4939.90	275.59	4937.61	305.11	4934.32	364.17	4931.70
413.38	4928.09	462.59	4925.14	541.33	4922.18	600.39	4918.90
620.07	4916.61	649.60	4913.65	708.65	4910.70	738.18	4908.08
757.86	4906.11	777.55	4903.48	807.08	4900.86	875.97	4897.25
905.50	4894.63	954.71	4891.34	994.08	4888.06	1053.14	4885.11
1102.35	4882.16	1131.88	4879.53	1161.40	4876.91	1200.77	4873.63
1230.30	4870.35	1249.98	4867.07	1289.35	4864.11	1348.41	4860.83
1377.94	4858.21	1476.36	4854.93	1624.00	4852.30	1653.52	4849.68
1771.63	4847.05	1889.74	4847.05	2047.22	4844.76	2096.43	4845.09
2145.64	4844.76	2273.59	4847.38	2342.49	4847.05	2450.76	4846.07
2539.34	4846.40	2618.08	4845.74	2677.13	4845.74	3120.04	4849.02
3553.11	4852.30	3996.01	4855.58	4310.97	4858.86	4576.71	4862.14
4852.30	4865.43	4921.20	4866.41				

¤

PACIFIC OCEAN

P05

0.00	4952.37	49.21	4951.71	68.90	4952.04	98.42	4952.37
226.38	4951.05	265.74	4949.09	314.96	4948.78	344.48	4948.43
374.01	4948.76	393.70	4949.09	413.38	4948.78	423.22	4948.43
482.28	4948.10	492.12	4947.77	501.96	4947.45	561.02	4944.16
590.54	4941.87	610.23	4939.57	639.76	4935.96	679.13	4933.01
718.50	4930.06	748.02	4926.78	767.71	4924.15	807.08	4920.54
895.66	4917.92	915.34	4915.62	944.87	4912.34	974.40	4909.06
1003.92	4906.11	1043.29	4903.81	1082.66	4900.86	1151.56	4897.91
1190.93	4895.28	1230.30	4892.00	1279.51	4889.38	1338.57	4886.09
1397.62	4882.81	1456.68	4879.86	1515.73	4876.58	1574.78	4873.30
1633.84	4870.35	1702.74	4867.07	1751.95	4864.11	1801.16	4861.16
1860.21	4858.21	1919.27	4855.25	2066.90	4852.63	2106.27	4852.96
2125.96	4852.63	2165.33	4851.32	2362.18	4851.97	2431.07	4851.32
2568.87	4852.30	2627.92	4851.32	2696.82	4852.30	2755.87	4852.63
2814.93	4852.30	2972.40	4852.63	3169.25	4851.64	3267.68	4852.30
3681.06	4855.58	4035.38	4858.86	4350.34	4862.14	4675.14	4865.43
4803.09	4867.07						

¤

P06

0.00	4930.39	90.22	4931.30	171.59	4932.22	255.57	4932.85
271.65	4931.77	288.05	4928.98	303.47	4927.37	317.91	4926.19
401.90	4926.88	434.05	4921.84	452.42	4916.48	469.15	4910.60
483.26	4909.72	534.11	4908.70	549.53	4908.01	566.59	4906.70
583.98	4903.98	599.73	4900.76	615.48	4897.71	631.55	4892.66
648.61	4890.52	665.67	4889.24	681.75	4887.54	697.83	4885.87
731.62	4884.91	761.47	4881.83	824.47	4880.03	843.49	4877.99
877.29	4875.50	942.57	4873.07	1007.53	4870.64	1059.70	4868.31
1124.33	4865.69	1221.11	4863.52	1303.13	4861.46	1403.20	4859.45
1502.61	4857.55	1615.47	4856.30	1713.89	4854.34	1829.70	4853.68
1944.86	4854.43	2059.36	4854.34	2173.20	4854.43	2336.59	4855.39
2501.94	4856.30	2661.38	4857.62	2829.36	4857.95	2992.75	4859.16
3173.85	4859.95	3336.90	4860.93	3502.25	4861.55	3714.85	4863.16
3928.76	4864.84	4076.39	4865.52	4222.39	4866.74	4388.07	4868.61
5338.52	4877.83	5521.26	4879.57	5717.12	4881.57	5912.00	4883.83
4583.93	4870.51	4783.41	4872.51	4992.07	4874.74	5159.06	4876.35
6108.85	4886.29	6323.09	4889.02	6438.57	4890.36	6553.73	4891.87
8209.88	4916.64	9849.62	4942.75	11489.36	4970.35	12771.82	4992.49
13132.71	4998.92	14772.45	5028.48	15755.05	5046.46		

¤

P07

0.00	4952.66	91.53	4954.34	171.26	4955.55	271.32	4956.73
303.15	4958.40	337.27	4961.16	368.11	4962.44	383.85	4961.26
401.90	4959.49	417.97	4957.29	433.72	4950.79	449.80	4941.11
467.19	4934.98	484.57	4931.99	501.31	4930.39	517.71	4927.23
533.46	4924.45	549.53	4921.36	565.94	4914.80	582.34	4909.91
598.75	4905.84	614.82	4903.32	629.91	4902.24	647.30	4900.40
682.41	4898.92	729.98	4897.38	795.59	4895.38	862.52	4893.34
910.42	4890.59	942.90	4888.29	993.10	4885.27	1041.98	4883.11
1091.52	4880.75	1157.14	4878.06	1222.75	4876.02	1287.71	4873.73
1337.58	4871.63	1386.14	4868.54	1436.01	4865.49	1500.31	4862.61
1548.87	4859.91	1617.11	4857.22	1731.28	4854.40	1829.05	4852.20
1911.39	4850.17	2060.01	4848.82	2220.77	4849.05	2404.50	4851.05
2618.41	4852.66	2845.77	4854.83	2994.71	4856.01	3156.79	4856.11
3323.78	4858.08	3504.88	4859.88	3680.40	4861.03	3863.14	4862.67
4043.26	4864.61	4240.43	4866.57	4404.14	4868.12	4568.52	4869.30
4746.99	4871.04	4947.12	4872.81	5159.39	4875.07	5387.73	4877.73
5568.50	4879.57	5765.68	4881.54	5946.12	4883.73	6143.95	4886.39
6337.85	4888.92	6555.04	4891.84	8210.86	4916.28	9851.26	4942.52
11490.67	4970.08	12525.44	4988.13	13132.06	4998.92	14771.14	5028.32
16412.86	5058.40	17066.05	5070.48				

¤

PACIFIC OCEAN

P08

0.00	4983.40	37.73	4983.86	55.12	4981.20	72.51	4977.63
88.91	4976.35	122.05	4974.48	139.11	4972.25	154.53	4969.23
169.95	4967.36	253.93	4966.18	351.37	4966.47	434.71	4967.69
581.69	4967.26	631.55	4965.88	677.81	4963.23	748.02	4961.98
794.94	4959.91	828.40	4958.70	860.55	4956.73	925.19	4954.76
1007.86	4953.02	1024.27	4951.19	1059.04	4948.14	1075.77	4944.89
1091.85	4940.46	1107.93	4937.05	1123.67	4933.60	1140.41	4931.99
1172.89	4929.80	1205.04	4927.86	1223.08	4926.09	1240.80	4924.12
1273.28	4921.36	1320.85	4919.30	1337.91	4917.59	1370.72	4914.67
1434.37	4912.41	1516.71	4910.64	1533.12	4909.03	1550.18	4906.27
1567.24	4903.88	1583.31	4901.12	1599.06	4899.45	1615.14	4896.92
1630.56	4894.33	1647.29	4890.56	1664.68	4888.16	1681.41	4889.90
1697.16	4892.59	1713.23	4893.80	1730.29	4893.80	1746.70	4892.33
1762.12	4889.41	1778.85	4883.67	1795.91	4877.99	1812.97	4874.41
1830.36	4871.40	1847.09	4869.04	1877.93	4866.38	1928.13	4868.87
1976.68	4867.69	2011.46	4865.33	2043.61	4863.39	2107.91	4860.73
2222.74	4858.80	2353.97	4857.52	2452.40	4856.54	2566.90	4857.42
2715.52	4856.18	2830.02	4856.14	2943.53	4856.27	3058.03	4855.98
3191.56	4856.50	3353.96	4856.57	3533.75	4858.44	3682.37	4858.86
3830.66	4859.42	3994.05	4860.93	4175.14	4862.31	4338.86	4863.95
4551.45	4866.05	4699.09	4867.59	4830.32	4868.97	4979.60	4870.74
5158.73	4872.87	5340.48	4875.14	5521.26	4877.46	5699.73	4879.66
5898.55	4882.29	6062.59	4884.49	6224.00	4886.79	6389.36	4889.21
6554.38	4891.54	8211.51	4916.11	9850.60	4942.49	11491.98	4970.18
13361.06	5002.73	14773.11	5027.96	16412.52	5057.61	18053.91	5087.80
19756.31	5119.59						

¤

P09

0.00	4979.60	13.12	4979.83	37.07	4977.66	87.93	4977.17
101.38	4973.56	122.05	4969.63	139.76	4968.02	172.90	4966.38
204.72	4964.70	221.13	4963.32	236.55	4961.49	253.93	4959.88
287.07	4958.04	318.57	4955.88	353.01	4955.22	368.43	4953.45
383.20	4952.20	399.27	4950.96	417.32	4949.84	435.69	4947.51
451.44	4943.21	466.86	4939.54	482.61	4936.13	499.67	4931.86
516.73	4929.20	532.47	4926.75	582.34	4924.48	597.76	4923.10
614.82	4920.77	630.24	4917.75	645.33	4915.75	677.81	4913.69
712.59	4911.62	743.43	4909.95	760.82	4908.70	779.19	4906.34
795.92	4904.63	828.73	4901.84	860.55	4899.71	924.86	4897.71
940.61	4895.51	958.65	4892.46	976.69	4891.08	992.11	4879.34
1006.55	4866.38	1021.64	4854.37	1039.69	4841.31	1058.06	4836.23
1075.77	4833.60	1187.32	4832.91	1239.16	4829.60	1269.01	4830.29
1286.40	4831.73	1302.81	4834.68	1319.87	4836.23	1336.60	4836.72
1385.15	4834.75	1402.54	4832.32	1419.60	4830.29	1435.68	4831.11
1450.44	4836.23	1466.85	4840.36	1484.56	4843.21	1500.64	4849.91
1516.06	4860.01	1533.12	4866.18	1550.51	4867.46	1566.25	4862.18
1581.02	4854.47	1598.41	4849.81	1616.12	4848.04	1648.27	4851.22
1664.68	4856.18	1681.08	4860.54	1713.89	4863.03	1745.71	4860.67
1762.45	4856.63	1778.85	4854.17	1795.25	4847.74	1811.33	4841.02
1877.27	4838.55	1893.68	4838.00	1911.39	4840.49	1944.53	4840.03
1960.61	4842.56	1974.71	4843.68	1990.79	4841.84	2007.52	4840.03
2089.87	4838.43	2106.27	4839.34	2121.36	4840.52	2154.17	4843.57
2370.05	4845.51	2598.72	4847.51	2764.07	4849.15	2928.77	4849.41
3126.60	4850.46	3336.57	4852.27	3502.91	4852.50	3697.13	4854.24
3864.78	4856.37	4040.63	4858.21	4206.97	4859.65	4386.76	4861.95
4586.56	4864.14	4783.08	4866.67	4977.96	4868.87	5191.21	4871.50
5388.08	4873.50	5583.92	4876.22	5798.81	4879.34	5994.35	4881.93
6192.51	4884.75	6405.11	4888.03	6553.40	4890.23	8210.86	4915.13
9849.62	4941.87	11096.32	4962.77	11488.05	4969.66	13130.09	4998.73
14773.44	5027.89	16414.16	5057.61	18051.61	5087.77	19739.59	5119.26

PACIFIC OCEAN

P10

0.00	4940.10	39.37	4940.59	55.45	4940.49	70.54	4940.16
88.25	4936.32	104.66	4934.71	121.06	4930.88	136.81	4922.05
153.87	4917.16	171.26	4914.38	204.72	4911.72	220.14	4910.73
253.28	4908.11	303.47	4906.30	319.22	4904.60	334.97	4901.48
350.39	4899.41	367.12	4899.25	401.24	4896.17	417.97	4893.94
450.78	4892.30	466.53	4890.39	482.61	4888.23	516.07	4885.08
531.49	4882.48	546.91	4878.78	565.28	4876.55	597.43	4873.76
614.17	4872.05	629.59	4869.69	645.66	4867.43	662.72	4866.38
679.45	4869.86	694.87	4872.28	710.29	4874.35	729.32	4878.68
745.40	4880.58	778.86	4879.73	793.63	4878.16	811.67	4872.91
827.42	4868.41	844.48	4862.24	860.88	4857.19	877.29	4854.01
892.38	4852.79	908.78	4854.47	926.17	4857.52	942.25	4859.62
975.71	4861.06	992.11	4856.89	1008.52	4849.64	1024.92	4846.50
1073.48	4844.50	1090.87	4842.10	1107.93	4840.23	1124.33	4838.16
1139.09	4836.69	1154.84	4836.79	1172.23	4838.13	1207.01	4839.47
1239.49	4841.67	1255.89	4843.08	1270.65	4844.43	1286.73	4845.21
1384.17	4842.89	1449.79	4841.05	1500.31	4838.10	1630.56	4836.29
1712.91	4835.31	1745.06	4837.28	1780.49	4839.54	1828.39	4841.51
1861.53	4843.34	1878.26	4843.97	1910.08	4844.92	2091.84	4844.69
2157.78	4841.57	2287.70	4841.34	2433.70	4842.30	2565.59	4842.26
2732.58	4843.41	2911.05	4845.21	3092.15	4847.32	3271.94	4848.59
3468.46	4851.09	3667.61	4852.83	3880.20	4854.76	4076.07	4857.00
4271.93	4859.36	4470.75	4861.85	4684.00	4864.34	4862.47	4866.64
5043.25	4869.04	5240.42	4871.73	5421.52	4874.12	5602.62	4876.58
5798.81	4879.17	5978.60	4881.80	6177.09	4884.59	6357.21	4887.41
19726.46	5119.10	0.00	0.00	0.00	0.00	0.00	0.00
12984.09	4995.97	14771.47	5027.86	16411.21	5057.58	18051.61	5087.86
19726.46	5119.10						

¤

I 01

0.00	5055.05	3.28	5055.05	6.56	5055.05	9.84	5055.71
13.12	5055.38	19.68	5055.05	22.97	5055.05	29.53	5054.73
32.81	5054.40	36.09	5054.07	39.70	5053.74	42.98	5053.41
46 26	5053.41	49.54	5053.41	52.82	5053.41	56.10	5055.38
59.38	5053.41	62.66	5053.41	65.94	5053.41	69.22	5053.41
72.51	5053.41	75.79	5053.74	79.07	5053.41	82.35	5053.41
85.63	5053.74	88.91	5053.41	92.19	5053.41	95.47	5053.74
98.75	5053.74	102.03	5054.07	105.31	5053.74	108.59	5053.74
111.88	5053.74	118.44	5053.74	121.72	5053.74	125.33	5053.74
128.61	5053.41	135.17	5053.41	138.45	5053.41	141.73	5053.41
145.01	5053.41	148.29	5053.09	151.57	5053.09	154.85	5052.76
158.13	5052.76	161.42	5052.43	164.70	5052.43	181.10	5052.10
197.50	5052.10	214.24	5051.45	230.64	5050.13	247.04	5048.82
263.45	5048.50	279.85	5048.82	296.26	5048.82	312.99	5048.82
329.39	5049.15	345.80	5049.48	362.20	5049.48	378.60	5049.48
395.01	5048.50	411.74	5047.51	428.14	5045.87	444.55	5045.21
460.95	5043.57	477.36	5039.64	493.76	5019.30	510.16	5011.75
526.57	5001.25	542.97	4991.08	559.38	4980.91	576.11	4978.61
592.51	4971.07	608.92	4968.44	625.32	4963.20	641.72	4959.59
658.13	4955.32	740.15	4946.79	822.17	4940.88	903.86	4936.29
985.88	4930.06	1067.90	4927.11	1149.92	4927.43	1231.61	4923.82
1313.63	4922.18	1395.65	4921.53	1477.34	4922.84	1559.36	4926.45
1641.06	4923.50	1723.08	4930.06	1804.77	4932.03	1886.46	4921.20
1968.48	4915.95	2050.17	4915.95	2138.42	4918.25	2213.56	4918.90
2296.56	4920.21	2377.27	4920.54	2458.96	4921.53	2540.65	4935.96
2624.64	4935.96	2704.04	4930.71	2785.73	4925.79	2870.70	4917.59
2952.72	4916.93	3030.80	4913.32	3112.49	4911.36	3194.19	4909.72
3275.55	4908.73	3357.24	4908.08	3438.93	4905.78	3520.63	4905.45
3608.88	4906.11	3683.68	4904.47	3765.05	4902.83	3846.74	4902.83
3936.96	4902.17	4009.79	4902.83	4091.49	4904.47	4172.85	4905.13
4254.21	4903.81	4335.91	4903.81	4417.27	4903.81	4501.91	4908.08
4593.12	4906.44	4661.69	4905.78	4743.05	4903.48	4824.42	4900.53
4906.11	4898.89	4987.47	4898.89	5068.84	4899.55	5150.20	4899.88
5249.28	4898.89	5312.93	4897.25	5394.29	4894.95	5475.66	4895.94
5560.30	4895.61	5638.05	4895.94	5719.42	4895.94	5800.78	4894.30
5882.14	4894.95	5963.51	4895.28	6044.55	4895.28	6125.91	4895.94
6207.27	4895.94	6288.31	4896.59	6369.67	4897.25	6453.99	4897.91
6532.07	4898.56						

TABLE (XVI). Numerical values of sound speeds (in feet/sec) for SIMAS profiles.

ATLANTIC OCEAN

A 01

0.00	4965.95	108.30	4967.75	449.99	4961.95	899.99	4953.94
999.99	4945.94	1249.98	4939.93	1499.98	4935.93	1749.98	4931.93
1999.98	4929.93	2249.97	4929.93	2499.97	4930.95	2749.97	4931.93
2999.96	4933.93	3249.96	4936.95	3499.96	4939.93	3999.95	4945.94
4499.95	4942.95	4999.94	4936.95	5999.93	4928.94	6999.91	4926.94
8999.89	4948.96	11999.85	4994.95	14999.82	5043.93	17401.20	5083.93

¤

A 02

0 00	4965.95	449.99	4961.95	699.99	4953.94	999.99	4945.94
1249 98	4939.93	1499.98	4935.93	1749.98	4931.93	1999.98	4929.93
2249.97	4929.93	2499.97	4930.95	2749.97	4931.93	2999.96	4933.93
3249 96	4936.95	3499.96	4939.93	3999.95	4945.94	4499.95	4942.95
4999.94	4936.95	5999.93	4928.94	6999.91	4926.94	8999.89	4948.96
11999.85	4994.95	14999.82	5043.93	17718.28	5089.24		

¤

A 03

0.00	5007.00	65.90	5008.10	200.00	5002.00	250.00	4996.00
500 00	4982.00	750.00	4970.00	1000.00	4960.00	1250.00	4952.00
1500 00	4947.00	1750.00	4942.00	2000.00	4939.00	2250.00	4936.00
2500.00	4933.00	2750.00	4930.00	3000.00	4928.00	3250.00	4926.00
3500 00	4924.00	4000.00	4920.00	4500.00	4917.00	5000.00	4915.00
6000.00	4918.00	7081.80	4926.70				

¤

A 04

0.00	5034.70	24.60	5035.90	95.50	5008.30	209.00	4988.50
498 10	4986.70	752.30	4988.90	987.30	4991.80	1000.00	4992.00
1250.00	4994.00	1500.00	4992.00	1750.00	4985.00	2000.00	4973.00
2250.00	4958.00	2500.00	4940.00	2750.00	4923.00	3000.00	4909.00
3250.00	4900.00	3500.00	4893.00	4000.00	4888.00	4500.00	4891.00
5000.00	4896.00	6000.00	4908.00	7000.00	4921.00	9000.00	4949.00
12000.00	4995.00	15000.00	5044.00	18534.60	5102.90		

¤

ATLANTIC OCEAN

A 05

0.00	5059.50	36.10	5060.10	196.90	5021.20	344.50	5001.90
492 10	4998.00	738.20	4997.40	1000.00	4999.00	1200.80	5000.30
1250.00	5000.00	1500.00	4998.00	1750.00	4994.00	2000.00	4985.00
2250.00	4970.00	2500.00	4953.00	2750.00	4937.00	3000.00	4922.00
3250.00	4911.00	3500.00	4902.00	4000.00	4892.00	4500.00	4891.00
5000.00	4896.00	6000.00	4908.00	7000.00	4921.00	9000.00	4949.00
12000.00	4995.00	15000.00	5044.00	18671.60	5105.20		

¤

A 06

0.00	5056.90	88.60	5059.10	164.00	5032.50	344.50	5003.30
492 10	4998.50	738.20	4997.90	1000.00	4999.00	1200.80	4999.90
1250 00	5000.00	1500.00	4998.00	1750.00	4994.00	2000.00	4985.00
2250 00	4970.00	2500.00	4953.00	2750.00	4937.00	3000.00	4922.00
3250 00	4911.00	3500.00	4902.00	4000.00	4892.00	4500.00	4891.00
5000.00	4896.00	6000.00	4908.00	7000.00	4921.00	9000.00	4949.00
12000.00	4995.00	15000.00	5044.00	18671.90	5105.20		

¤

PACIFIC OCEAN

P01

0.00	4951.84	78.71	4952.14	187.01	4896.33	295.30	4888.75
492.09	4872.64	748.09	4866.84	1000.68	4856.93	1249.98	4847.94
1499.98	4843.94	1749.98	4841.93	1999.98	4840.95	2249.97	4841.93
2499.97	4843.94	2749.97	4816.95	2999.96	4848.96	3249.96	4850.93
3499.96	4852.93	3999.95	4857.95	4499.95	4862.93	4999.94	4868.94
5999.93	4882.95	6999.91	4898.96	8999.89	4929.93	11999.85	4978.94
14999.82	5030.94	17893.97	5083.04				

¤

P02

0.00	5014.93	78.71	5015.32	89.99	5015.13	200.00	4957.95
300.00	4942.95	499.99	4933.93	999.99	4917.95	1249.98	4904.93
1499.98	4889.93	1749.98	4875.93	1999.98	4865.95	2249.97	4858.93
2499.97	4854.93	2749.97	4853.95	2999.96	4855.95	3249.96	4856.93
3499.96	4858.93	3999.95	4863.95	4499.95	4868.94	4999.94	4873.96
5999.93	4884.95	6999.91	4898.96	8999.89	4929.93	11999.85	4978.94
14999.82	5030.94	17999.77	5084.95	19831.15	5118.75		

¤

P03

0.00	4994.43	98.39	4988.03	196.91	4973.82	295.30	4987.85
502.00	4965.23	748.09	4962.34	994.08	4956.04	999.99	4955.94
1249.98	4910.95	1499.98	4923.96	1749.98	4905.95	1999.98	4888.95
2249.97	4877.93	2499.97	4871.95	2749.97	4866.93	2999.96	4864.93
3249.96	4862.93	3499.96	4861.95	3999.95	4862.93	4499.95	4866.93
4999.94	4871.95	5999.93	4883.93	6999.91	4898.96	8999.89	4929.93
11999.85	4978.94	14999.82	5030.94	17999.77	5084.95	19846.05	5120.05

¤

P04

0.00	4974.94	59.09	4975.92	1249.98	4969.95	1499.98	4955.94
1749.98	4938.95	1999.98	4919.95	2249.97	4903.94	2499.97	4890.95
2749.97	4880.95	2999.96	4873.96	3249.96	4868.94	3499.96	4865.95
3999.95	4864.93	4499.95	4866.93	4999.94	4871.95	5999.93	4883.93
6999.9[illegible]	4898.96	8999.89	4929.93	11999.85	4978.94	14999.82	5030.94
18584.39	5095.44						

¤

PACIFIC OCEAN

P05

0.00	4938.95	19.68	4939.25	499.99	4919.95	749.99	4902.93
999.99	4886.95	1249.98	4868.94	1499.98	4858.93	1749.98	4852.93
1999.98	4849.94	2249.97	4847.94	2499.97	4847.94	2749.97	4847.94
2999.96	4848.96	3249.96	4849.94	3499.96	4851.94	3999.95	4857.95
4499.95	4863.95	4999.94	4869.95	5999.93	4883.93	6999.91	4898.96
8999.89	4929.93	11999.85	4978.94	14999.82	5030.94	18540.16	5094.62

¤

P06

0.00	4927.73	8.89	4927.93	205.71	4930.02	401.90	4924.55
534.08	4905.25	748.09	4880.13	992.80	4865.33	999.99	4864.93
1249.98	4859.95	1499.98	4855.95	1749.98	4853.95	1999.98	4852.93
2249.97	4851.94	2499.97	4851.94	2749.97	4853.95	2999.96	4854.93
3249.96	4857.95	3499.96	4859.95	3999.95	4863.95	4499.95	4867.95
4999.94	4872.94	5999.93	4883.93	6999.91	4898.96	8999.89	4929.93
11999.85	4978.94	14999.82	5030.94	16324.00	5054.73		

¤

P07

0.00	4958.44	74.51	4959.65	201.69	4961.75	401.90	4964.05
533.49	4930.95	729.98	4902.93	993.20	4890.23	999.99	4889.93
1249.98	4873.96	1499.98	4863.95	1749.98	4853.95	1999.98	4849.94
2249.97	4849.94	2499.97	4849.94	2749.97	4852.93	2999.96	4854.93
3249.96	4856.93	3499.96	4859.95	3999.95	4863.95	4499.95	4867.95
4999.94	4872.94	5999.93	4884.95	6999.91	4898.96	8999.89	4929.93
11999.85	4978.94	14999.82	5030.94	17279.28	5071.95		

¤

P08

0.00	4972.94	2.00	4972.94	1499.98	4967.95	1749.98	4951.94
1999.98	4933.93	2249.97	4915.95	2499.97	4897.94	2749.97	4883.93
2999.96	4873.96	3249.96	4868.94	3499.96	4865.95	3999.95	4864.93
4499.95	4866.93	4999.94	4871.95	5999.93	4883.93	6999.91	4898.96
8999.89	4929.93	11999.85	4978.94	14999.82	5030.94	17999.77	5084.95
19860.94	5120.34						

¤

PACIFIC OCEAN

P09

0.00	4972.94	1499.98	4967.95	1749.98	4951.94	1999.98	4933.93
2249.97	4915.95	2499.97	4897.94	2749.97	4883.93	2999.96	4873.96
3249.96	4868.94	3499.96	4865.95	3999.95	4864.93	4499.95	4866.93
4999.94	4871.95	5999.93	4883.93	6999.91	4898.96	8999.89	4929.93
11999.85	4978.94	14999.82	5030.94	17999.77	5084.95	19223.25	5108.14

¤

P10

0.00	4972.94	70.90	4973.04	1499.98	4967.95	1749.98	4951.94
1999.98	4933.93	2249.97	4915.95	2499.97	4897.94	2749.97	4883.93
2999.96	4873.96	3249.96	4868.94	3499.96	4865.95	3999.95	4864.93
4499.95	4866.93	4999.94	4871.95	5999.93	4883.93	6999.91	4898.96
8999.89	4929.93	11999.85	4978.94	14999.82	5030.94	17999.77	5084.95
19223.25	5108.14						

¤

INDIAN OCEAN

101

		LAT 04 49 N		LON 53 02 E		MARCH	
00	5047.40	82.40	5045.90	164.70	5045.10	329.40	5041.30
493 80	5019.00	740.20	4941.20	1000.00	4928.00	1150.00	4920.40
1250.00	4922.00	1500.00	4921.00	1750.00	4920.00	2000.00	4920.00
2250.00	4919.00	2500.00	4917.00	2750.00	4915.00	3000.00	4913.00
3250.00	4911.00	3500.00	4910.00	4000.00	4906.00	4500.00	4903.00
5000.00	4902.00	6000.00	4904.00	7000.00	4908.00	9000.00	4931.00
12000.00	4978.00	15000.00	5025.00	17550.00	5072.60		

TABLE (XVII). Numerical values of sound speeds (in feet/sec) for ICAPS profiles.

ATLANTIC OCEAN

A 01

0.00	4955.65	137.79	4956.63	337.92	4959.91	383.85	4956.63
433.07	4946.13	511.80	4942.52	567.58	4939.90	652.88	4940.23
708.65	4937.61	725.06	4939.25	741.46	4938.26	800.52	4941.54
971.12	4934.00	997.36	4936.95	1049.86	4934.00	1079.38	4932.36
1095.79	4934.98	1377.94	4933.67	1525.57	4932.68	1968.48	4932.36
2624.64	4937.93	3280.80	4942.20	3936.96	4943.18	4921.20	4929.07
6561.60	4924.15	8202.00	4939.57	9842.40	4961.55	13123.20	5013.72
16404.00	5071.79	17125.77	5084.91				

¤

A 02

0.00	4953.68	154.20	4954.99	232.94	4954.01	311.68	4954.34
406.82	4954.66	439.63	4952.04	469.15	4946.79	567.58	4941.21
688 97	4940.88	754.58	4943.18	853.01	4939.25	1115.47	4934.32
1328.72	4934.00	1525.57	4933.67	1968.48	4933.34	2624.64	4938.59
3280.80	4942.85	3936.96	4943.51	4921.20	4929.40	6561.60	4924.15
8202.00	4939.57	9842.40	4961.88	13123.20	5013.72	16404.00	5071.79
17913.17	5099.02						

¤

A 03

0.00	5008.14	22.97	5008.47	65.62	5009.13	88.58	5003.55
108 27	4982.55	154.20	4974.68	200.13	4964.83	246.06	4960.24
436 35	4954.99	675.84	4952.37	997.36	4944.16	1643.68	4933.34
2490.13	4917.26	3280.80	4905.13	3936.96	4902.83	4921.20	4902.83
6561.60	4917.59	8202.00	4939.57	9842.40	4961.88	13123.20	5011.75
13418.47	5016.67						

¤

A 04

0 00	5036.03	36.09	5036.68	52.49	5029.14	72.18	5022.91
95 14	5010.11	121.39	5002.89	147.64	4996.98	206.69	4991.08
282 15	4987.80	948.15	4993.05	1115.47	4996.00	1210.62	4997.64
1361 53	4991.08	1706.02	4978.94	1994.73	4965.82	2526.22	4935.30
3280 30	4896.59	3936.96	4888.39	4921.20	4895.61	6561.60	4916.61
8202 00	4940.55	9842.40	4963.85	13123.20	5012.08	16404.00	5068.84
17716.32	5091.80						

¤

ATLANTIC OCEAN

A 05

0.00	5059.65	65.62	5059.65	82.02	5059.32	104.99	5057.02
203.41	5020.28	249.34	5012.73	328.08	5004.53	426.50	5000.59
708.65	4999.61	935.03	5000.27	1089.23	5000.59	1230.30	5001.91
1312.32	5002.23	1482.92	5001.91	1706.02	5000.59	1902.86	4993.38
2099.71	4982.55	2230.94	4977.96	2378.58	4968.11	2493.41	4961.88
3280.80	4914.96	3936.96	4899.55	4921.20	4901.52	6561.60	4919.23
8202.00	4940.88	9842.40	4962.87	13123.20	5012.73	16404.00	5069.16
17519.47	5088.85						

¤

A 06

0.00	5057.35	59.05	5058.66	88.58	5060.30	164.04	5034.39
252 62	5012.73	344.48	5005.52	492.12	5000.59	1640.40	5002.56
1843 81	4998.30	2099.71	4985.50	2624.64	4953.68	3280.80	4914.64
3936 96	4899.22	4921.20	4901.52	6561.60	4919.23	8202.00	4940.55
9842 40	4962.87	13123.20	5012.73	16404.00	5069.16	17519.47	5088.85

¤

PACIFIC OCEAN

P01

0.00	4954.34	108.27	4950.40	137.79	4919.23	157.48	4905.13
255.90	4899.22	285.43	4894.95	324.80	4888.72	374.01	4878.88
423.22	4871.33	521.65	4881.17	659.44	4877.89	787.39	4871.00
974.40	4863.79	1200.77	4853.29	1318.88	4849.68	1515.73	4845.09
1968.48	4842.79	2624.64	4846.07	3280.80	4851.32	3936.96	4857.55
4921.20	4869.04	6561.60	4891.34	8202.00	4916.28	9842.40	4942.52
13123.20	4998.95	16404.00	5058.34	17749.13	5082.94		

¤

P02

0.00	5005.19	127.95	5005.52	157.48	4998.95	196.85	4961.88
265.74	4936.95	344.48	4914.64	442.91	4907.75	511.80	4907.75
629.91	4913.32	757.86	4909.72	984.24	4901.84	1151.56	4895.94
1318.88	4888.72	1515.73	4878.22	1968.48	4864.77	2624.64	4861.49
3280.80	4863.13	3936.96	4864.44	4921.20	4873.98	6561.60	4892.33
8202.00	4916.28	9842.40	4942.85	13123.20	4998.95	16404.00	5058.34
17978.79	5087.54						

¤

P03

0.00	4999.61	39.37	4996.66	68.90	4995.34	78.74	4994.69
137.79	4986.82	196.85	4979.27	383.85	4971.72	561.02	4970.41
748.02	4967.13	1053.14	4958.27	1309.04	4945.80	1515.73	4932.03
1968.48	4893.97	2624.64	4864.44	3280.80	4859.52	3936.96	4861.49
4921.20	4872.32	6561.60	4891.34	8202.00	4915.95	9842.40	4942.52
13123.20	4998.63	16404.00	5057.68	19192.68	5108.53		

¤

P04

0.00	4945.15	78.74	4945.48	167.32	4943.51	285.43	4937.93
413.38	4928.75	600.39	4920.21	718.50	4910.37	836.60	4900.53
1141.72	4880.19	1318.88	4883.79	1515.73	4856.24	1968.48	4845.09
2624.64	4844.43	3280.80	4849.02	3936.96	4855.25	4921.20	4867.07
6561.60	4889.70	8202.00	4914.64	9842.40	4941.87	13123.20	4998.63
16404.00	5057.02	17978.79	5085.57				

¤

P05

0.00	4953.35	344.48	4949.74	590.54	4942.85	767.7'	4925.46
954.71	4913.00	1181.09	4897.25	1318.88	4888.06	1515.73	4877.24
1968.48	4858.54	2624.64	4853.29	3280.80	4855.91	3936.96	4860.18
4921.20	4869.69	6561.60	4890.69	8202.00	4914.96	9842.40	4941.54
13123.20	4998.30	16404.00	5057.35	17978.79	5085.89		

¤

P06

0.00	4929.40	206.69	4932.03	272.31	4931.04	334.64	4924.81
370.73	4926.45	403.54	4927.43	469.15	4912.01	534.77	4909.06
600.39	4901.19	666.00	4890.69	731.62	4884.78	793.95	4880.85
862.85	4875.93	928.47	4873.30	990.80	4870.68	1059.70	4868.05
1122.03	4865.10	1190.93	4863.79	1253.27	4862.14	1318.88	4860.83
1387.78	4859.19	1450.11	4857.88	1502.61	4857.22	1968.48	4853.61
2624.64	4855.25	3280.80	4858.86	3936.96	4863.79	4921.20	4873.30
6561.60	4892.66	8202.00	4916.61	9842.40	4942.85	13123.20	4999.28
16174.34	5052.43						

¤

P07

0.00	4949.41	272.31	4953.02	318.24	4955.98	367.45	4958.93
403.54	4955.65	465.87	4933.01	534.77	4923.82	600.39	4905.78
666.00	4899.22	731.62	4896.92	797.23	4894.63	862.85	4893.31
925.19	4889.38	994.08	4884.45	1056.42	4881.83	1122.03	4879.21
1190.93	4876.58	1256.55	4875.27	1322.16	4872.64	1384.50	4868.38
1499.33	4862.47	1968.48	4857.88	2624.64	4858.54	3280.80	4860.83
3936.96	4865.43	4921.20	4874.29	6561.60	4892.98	8202.00	4916.93
9842.40	4942.85	13123.20	4999.28	16797.70	5063.26		

¤

P08

0.00	4983.54	36.09	4984.19	55.77	4980.91	72.18	4977.30
137.79	4972.71	200.13	4966.15	469.15	4967.46	531.49	4967.46
793.95	4960.57	925.19	4955.32	990.80	4955.32	1059.70	4948.76
1125.31	4934.32	1322.16	4920.21	1502.61	4912.34	1968.48	4881.50
2624.64	4849.35	3280.80	4845.09	3936.96	4851.97	4921.20	4864.11
6561.60	4889.38	8202.00	4914.96	9842.40	4942.20	13123.20	4998.63
16404.00	5057.35	17978.79	5086.55				

¤

PACIFIC OCEAN

P09

0.00	4979.27	13.12	4979.60	36.09	4976.97	68.90	4976.64
101.70	4973.36	141.07	4967.13	203.41	4964.18	400.26	4951.05
531.49	4927.11	597.11	4922.51	659.44	4914.31	725.06	4910.37
793.95	4904.47	859.57	4899.22	921.90	4896.59	990.80	4879.21
1059.70	4837.21	1253.27	4831.96	1318.88	4837.54	1450.11	4836.88
1499.33	4850.34	1968.48	4840.82	2624.64	4843.77	3280.80	4850.00
3936.96	4856.57	4921.20	4868.71	6561.60	4891.34	8202.00	4916.28
9842.40	4942.85	13123.20	4999.28	16404.00	5058.01	17978.79	5087.21

¤

P10

0.00	4940.55	68.90	4940.55	104.99	4934.98	137.79	4922.18
203.41	4912.01	400.26	4897.58	531.49	4883.14	597.11	4873.96
662.72	4867.07	695.53	4872.97	728.34	4878.88	761.15	4880.85
793.95	4878.88	859.57	4857.88	892.38	4852.96	925.19	4857.55
990.80	4857.55	1122.03	4839.18	1253.27	4842.79	1318.88	4844.10
1384.50	4843.77	1450.11	4842.13	1499.33	4838.85	1968.48	4835.24
2624.64	4838.52	3280.80	4842.79	3936.96	4851.64	4921.20	4864.44
6561.60	4888.72	8202.00	4914.64	9842.40	4941.87	13123.20	4998.30
16404.00	5058.01	17978.79	5087.21				

¤

INDIAN OCEAN

101

0.00	5056.70	157.48	5054.40	246.06	5050.79	393.70	5049.81
459.31	5044.89	475.72	5041.93	492.12	5026.84	524.93	5004.20
577.42	4981.89	626.63	4966.80	659.44	4958.93	823.48	4943.51
1394.34	4922.84	1476.36	4919.23	1558.38	4927.11	1640.40	4924.48
1722.42	4931.04	1804.44	4932.36	1886.46	4925.14	1968.48	4916.28
2050.50	4916.61	2139.08	4919.23	2214.54	4919.23	2296.56	4920.54
2378.58	4919.56	2460.60	4922.18	2539.34	4936.29	2624.64	4936.62
2785.40	4927.43	3280.80	4920.87	3936.96	4914.64	4921.20	4905.78
6561.60	4907.09	8202.00	4923.17	9842.40	4946.46	13123.20	4998.63
16404.00	5054.40						

REFERENCES

1. "Comparison of the ICAPS and SIMAS Historical Environmental Data Base", by E. Hashimoto, NORDA Code 321, FY-79 APP Task II Report, 28 September 1979 (in press NORDA TM-#66).

2. "ICAPS and SIMAS Sound Speed Profile Generation Methodologies", by J. Locklin and B.W. Scaife, ODSI, 21 April 1980, UNCLASSIFIED.

3. "The ICAPS Water Mass History File", by A. Fisher, Jr., NOO RP-19, May 1978.

4. "Description of ICAPS Environmental Data Structure", by J. Lever, NOO TM-3700-82-79, March 1979.

5. "A Functional Description of the Sonar In-Situ Mode Assessment System (SIMAS)" (U), G. Brown, Naval Underwater Systems Center, New London, CT, NUSC TM-781058, 16 February 1978 (CONFIDENTIAL).

6. "SIMAS Operations Aboard USS Console (F1056)" (U), G. Brown, Naval Underwater Systems Center, New London, CT, TM-222-C22-76, 31 December 1976 (CONFIDENTIAL).

7. "Oceanographic Analysis Manual for On-Scene Prediction Systems", A. Fisher, Jr., Naval Oceanographic Office, NSTL Station, MS, NOO RP-20, May 1978.

8. "Description of the ICAPS Environmental Data Structure", J. Lever, Naval Oceanographic Office, NSTL Station, MS, NOO TN-3700-82-79, March 1979.

9. "Evaluation of Standard Ocean Candidates", E. Hashimoto, S. Daubin, Jr., J. Colborn, Pacific Sierra Research Report 922, March 1980.

10. VanWyckhouse, R.J. (1979). SYBAPS, Volume I: Data Sources and Data Preparation (U). Naval Ocean Research and Development Activity, NSTL Station, MS NORDA Technical Note No. 35, CONFIDENTIAL.

11. VanWyckhouse, R.J. (1979). SYNBAPS, Volume II: Techniques of Structuring and Retrieval. Naval Ocean Research and Development Activity, NSTL Station, MS NORDA Technical Note No. 36 (in prep.)

12. Webster, J. (1979). SYNBAPS EDIT/PRINT Program. Ocean Data Systems, Inc. Rockville, MD. Technical Task Report, Contract N00014-77-C-0014.